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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PRELIMINARY ANNOUNCEMENT OF THE SECOND ATLANTIC CITY MEETING

Edited by Dr. HENRY B. WARD

PERMANENT SECRETARY

INTRODUCTION

ATLANTIC CITY will welcome the American Association and its associated societies for the ninety-ninth meeting, which will cover the week from December 28, 1936, to January 2, 1937. Previously one meeting has been held in Atlantic City; and this in December, 1932, though a departure from the consistent habit of meeting in the halls of some educational or research institution was described in SCIENCE by Dr. B. E. Livingston as conspicuously successful. When under unexpected conditions the Executive Committee was called upon to change the location previously decided upon for this year's meeting, the choice fell upon Atlantic City and information already assembled for this preliminary announcement foreshadows a repetition of the success of the 1932 experiment.

The locality, already well known to residents of the

nearby states and to members of professional societies which have met there previously, is well qualified to attract a large organization and to give it a satisfactory environment for a successful meeting. The December climate is mild, the sea air and sunshine invigorating and the easy access to all meeting places along the ocean-side Boardwalk attractive. The Municipal Auditorium affords a large number of well-planned meeting rooms as well as good accommodations for the general sessions, registration facilities and scientific exhibits. Nearby hotels have first-class assembly halls and smaller meeting rooms for such societies and groups as prefer separate locations. Yet these are sufficiently near the general meeting places and other societies to be free from the inconveniences of sessions separated by distances usual in city meetings. The compactness and convenience of the arrangements

made for the Atlantic City meeting will afford members in attendance unusual opportunities for conferences and informal contacts that will be thoroughly enjoyed.

The meeting of the British Association last September in Blackpool affords an interesting parallel to the coming meeting in Atlantic City. Like the latter, Blackpool is also a seaside resort city, famous equally for its sandy beach, the promenade along the sea and its numerous resorts. As the representative of the association, President Conklin participated in the Blackpool meeting and on his return had much to say in praise of the locality as well as the meeting. Others who have attended other meetings of the British Association have commented on the high value of the social privileges provided for those in attendance and on the personal association and constant informal exchange of opinions between workers in different scientific fields. Their formal programs are much less extended and the time devoted to the reading of papers is more limited. May it not be that the pressure at our meetings so often deplored might well be lightened by some such plan without incurring the evident losses that would follow the oft-suggested plan of resorting to a multitude of separate gatherings? The Atlantic City meeting is opportune for the discussion of such proposals. It will furnish also a basis for testing the value of setting aside a period to be devoted to general association functions such as has been provided this year. It is hoped that Association Day, described later in this announcement, may receive good general support and serve to open the way for wider interest and fuller participation in all functions of the association.

HOTELS IN ATLANTIC CITY

The general headquarters will be at Haddon Hall. Other Boardwalk hotels are as follows: *Ambassador, Brighton, Chalfonte, Chelsea, *Claridge, Dennis, Knickerbocker, Marlborough-Blenheim, New Belmont, *President, *Ritz-Carlton, Seaside, *Shelburne and Traymore.

Minimum rates for single rooms in nearly all boardwalk hotels are \$3.00, the exceptions being the Dennis, President and Traymore at \$3.50 and the Claridge, Marlborough-Blenheim and Shelburne at \$4.00. The number of rooms at this rate is not large. A few single rooms at \$2.50 are available in the New Belmont.

Twin-bedded rooms are numerous in all hotels, and the rates vary from \$5 to \$10. Those who wish to arrange to occupy a room with some one else may have very desirable rooms at rates per person equal to the minimum rate.

Avenue hotels include the Arlington, Colton Manor, Flanders, Franklin Inn, Glaslyn-Chatham, *Jefferson,

Kentucky, Lafayette, *Madison, Monticello, Morton, Princess, Richfield, Senator, Sterling and Thurber. Minimum rates for single rooms in these hotels are from \$2 to \$5 and double rooms with twin beds from \$4 to \$8.

Headquarters for the various groups have been assigned as follows:

Haddon Hall: American Association of Economic Entomologists; Entomological Society of America; Section on Medical Sciences; American Society for Horticultural Science; Society of the Sigma Xi; Phi Beta Kappa; Gamma Alpha Graduate Scientific Fraternity; Pi Gamma Mu.

Chalfonte: American Physical Society; American Association of Physics Teachers; Sigma Pi Sigma.

Ambassador: American Society of Zoologists; American Society of Parasitologists; Botanical Society of America; American Phytopathological Society; American Society of Plant Physiologists; Mycological Society of America; American Fern Society; Sullivant Moss Society; American Society of Naturalists; Ecological Society of America; Genetics Society of America; American Microscopical Society; Limnological Society of America.

Chelsea: Section on Psychology; Section on Education.

Claridge: Section on Engineering; Section on Social and Economic Sciences.

Dennis: Section on Historical and Philological Sciences; American Nature Study Society.

**Marlborough-Blenheim*: Section on Chemistry; Section on Astronomy; Section on Geology and Geography.

Morton: Section on Mathematics.

Ritz-Carlton: Potato Association of America; American Society of Agronomy.

Traymore: American Meteorological Society.

RAILROAD RATES

Reduced railway rates for conventions on the certificate plan have been discontinued. The new rates which became effective June last on many railroads are expected to approximate the old convention rates. It is also likely that at some places special Christmas fares will be available that will extend over the meeting period. Definite information on these rates is not yet available, and it is advisable therefore to make individual inquiries of local ticket agents before deciding upon routes.

REGISTRATION

The main registration headquarters will be in the Municipal Auditorium, where registration facilities will be opened on Monday and maintained throughout the week. Plans are being made for a branch registration office at Haddon Hall. Any one interested in the advancement of science or education may register as a guest for the meeting upon payment of the regis-

* The hotels marked with an asterisk have only rooms with bath. In the other hotels rates for rooms without bath are \$1.50 to \$3 single, and \$2.50 to \$5 double.

ration fee of \$1.00. Each registrant receives a copy of the General Program, an identification card and a badge, and is also privileged to visit the exhibition and all meetings desired.

At the main registration headquarters reservations may be made for excursions and banquets. Mail and telegrams will also be handled there.

GENERAL SESSIONS

The general session on Monday evening will be devoted, in accordance with the custom of the association, to the address of the retiring president, Dr. Karl T. Compton, of the Massachusetts Institute of Technology, whose subject will be "The Electron: Its Intellectual and Social Significance." This address will be given in the Ball Room of the Municipal Auditorium. The program of the evening will be opened by an address of welcome to Atlantic City and response on the part of the association by its president, Dr. Edwin Grant Conklin.

Following the address of the retiring president, a reception will be tendered to the officers and members of the association and its affiliated societies, together with invited guests. This reception will be held in Haddon Hall.

On Tuesday evening the general session is devoted to the Sigma Xi lecture. This, which is the fifteenth annual lecture under the joint auspices of the association and Sigma Xi, will be given by Dr. Henry G. Knight, chief of the Bureau of Chemistry and Soils, U. S. Department of Agriculture. Dr. Knight will present important recent researches on the topic, "Selenium and Its Relation to Soil, Plants, Animals and Public Health." This address represents important recent work which is as yet unpublished and will prove of especial interest to the members of the association.

On Wednesday evening comes the second annual Phi Beta Kappa lecture, which will be delivered by President James R. Angell, of Yale University, on the topic "The Scholar and the Specialist." This lecture is sponsored by the United Chapters of Phi Beta Kappa for the purpose of introducing into the association's large winter meetings a note which will show the intimate relation of science and general culture. The lecture is one of the general evening sessions open to the public. All local Phi Beta Kappa members will receive special invitations.

An exhibit of *The American Scholar*, Phi Beta Kappa's quarterly for general circulation, will be included in the Science Exhibition. Like the annual lecture, the magazine is designed both to interest the laymen in the understanding of science and the scientist in maintaining the breadth of reading essential even to the most effective specialization.

Thursday evening this year is given to the American Society of Naturalists for their annual dinner, followed by the address of the president, Professor C. E. Allen, of the University of Wisconsin, on "Haploid and Diploid Generations."

Friday evening has been set aside for a special demonstration of scientific research in moving picture films, which is a part of the Friday program considered later in this article.

Three afternoon general sessions of outstanding importance have been provided for the Atlantic City program. The first of these is a presentation of the physical phenomena observed by the visitor to the shore of the ocean. The paper entitled "The Optics of the Surface of the Sea" is to be given on Monday afternoon by Dr. E. O. Hulburt, of the Naval Research Laboratory. It is illustrated by lantern slides.

The second afternoon general session presents the work of Dr. P. W. Zimmerman and Dr. A. H. Hitchcock, of the Boyce Thompson Institute at Yonkers, N. Y., for which the association prize of \$1,000 was awarded at the St. Louis meeting. While this work was carried on by the two authors jointly, results will be presented by Dr. Zimmerman in a paper entitled "Response of Plants to Hormone-like Growth Substances." The talk will be illustrated by lantern slides and motion pictures. It will be given on Wednesday afternoon at 4:30.

The afternoon general session on Thursday at 4:30 is to be devoted to an address by Dr. C. C. Little, of the Roscoe B. Jackson Memorial Laboratory at Bar Harbor, Maine. Dr. Little will speak on "The Social Significance of Cancer."

The Friday afternoon general session will be incorporated in the special program for that day. This is dealt with as a unit later in this announcement.

RETIRING VICE-PRESIDENTIAL ADDRESSES

The vice-presidential addresses to be given at Atlantic City by the chairmen of the various sections include the following for which titles have been received:

"Recent Developments in the Theory of Integration," by Professor T. H. Hildebrandt, of the University of Michigan, before the Section on Mathematics.

"Electron Impact Phenomena in Gases," by Professor John T. Tate, of the University of Minnesota, before the Section on Physics.

"Reducing Potentials of Free Radicals," by Professor Moses Gomberg, of the University of Michigan, before the Section on Chemistry.

"Some Problems in Fundamental Astronomy," by Dr. Herbert R. Morgan, of the U. S. Naval Observatory, before the Section on Astronomy.

"Morphology as a Dynamic Science," by Professor

E. W. Sinnott, of Columbia University, before the Section on Botanical Sciences.

"Prehistoric Archeology, Past, Present and Future," by Dr. N. C. Nelson, of the American Museum of Natural History, before the Section on Anthropology.

"The Psychology of Art: Naïve Geometry," by Professor R. M. Ogden, of Cornell University, before the Section on Psychology.

"Remarks Concerning the History of Twentieth Century Science," by Dr. George Sarton, of Harvard University, before the Section on Historical and Philological Sciences.

"Agricultural Research in China," by Dr. H. K. Hayes, of the University of Minnesota, before the Section on Agriculture.

"Data Related to Classroom Learning," by Professor F. B. Knight, of the State University of Iowa, before the Section on Education.

Reference is made to these and others in the part of this preliminary report devoted to the separate sections and their affiliated societies.

PRESS SERVICE

A professor in one of our universities not long ago called attention to an important scientific discovery by reading to his class the press story written by one of the members of the National Association of Science Writers and based upon a paper delivered at one of our meetings.

More and more dependence is being placed on press accounts of scientific advance by all classes of the population. The daily press is the most important medium for the instruction of the people as a whole. It is to our interest to do all we can to provide the press with abundant scientific material so that the accounts of scientific advance may be both full and accurate.

So let every one who is to present a paper at the coming meeting do his part by sending in two copies of his paper to the Press Service as long in advance of the meeting as possible.

SCIENCE EXHIBITION

The annual science exhibition this year will be well housed in the Municipal Auditorium. Here it will be immediately accessible to the many sections and affiliated societies meeting in the building and only slightly removed from those holding sessions in neighboring hotels. The exhibits will be available to members of the association and guests without the inconvenience to association members, as on some previous occasions, of a large influx of city visitors. These conditions will make its use by members more effective and enjoyable. As previously the 1936 science books will be found in the science library, as an effective demonstration of the recorded progress of science during

this period. A list of these books will be printed in the issue of the *Scientific Monthly* for January, 1937, copies of which will be available at the Science Library.

OFFICIAL MEETINGS

The Council of the Association will hold its first meeting at 2:00 on Monday afternoon in Haddon Hall. Further sessions will convene promptly at nine each morning during the week. According to usage general matters brought before the Council are referred first to the Executive Committee for consideration and recommendation. Consequently business will be facilitated if matters are sent directly to the Executive Committee through the Permanent Secretary, whose office will be opened at the association headquarters in Haddon Hall on Sunday, December 27. Representatives on the Council from sections and societies are urged to attend all meetings so far as can be made possible.

The Academy Conference, which is composed of an official delegate from each affiliated academy, together with designated representatives from the association, will convene at 4:00 on Monday afternoon for its annual discussion of problems involving academy work and the relations of the academies to the association. The Academy dinner will follow at 6:15 and adjourn at 8:00 in order that members may attend the opening general session of the association.

The Secretaries' Conference, which includes in membership secretaries of all sections and all affiliated societies, will hold its session on Friday morning. A special announcement regarding further details will be sent individually at a later date to the members of this conference. The problems before the association call for the best assistance which can be rendered by the conference. It is hoped that all secretaries will plan to remain for this meeting in view of the importance to all interests concerned of the problems which demand careful discussion from different points of view if effective results are to be secured.

SOCIAL AFFAIRS

The annual reception tendered by the Atlantic City authorities to the officers and members of the association and affiliated societies will be held on Monday evening in Haddon Hall, immediately after the address of the retiring president. Those who remember the affair given on the occasion of the first Atlantic City meeting will recall with pleasure the attractive environment and exceptional opportunity for social contacts afforded on that occasion.

The Union of Biological Societies has arranged the joint smoker for all biologists to be held this year as usual on Tuesday evening after the general session.

Arrangements have been made to insure the prompt closing of earlier events so that appropriate time will be available for the smoker.

The arrangements for a joint smoker to include mathematical, chemical and physical sciences, as well as engineering, have not yet been completed. A later announcement may be expected.

Dinners of special societies and individual groups have been arranged for Tuesday and Wednesday evening. Special luncheons for other societies are announced for noon hours. Precise details regarding these items will be given in the special announcements sent out by individual societies or found in the records concerning sectional and society programs which follow in this article.

The number of meetings, conferences, dinners, luncheons and other gatherings listed is so great that it emphasizes again, as has been noted on other previous occasions, that the pressure of events is unfortunately large. Much would be gained for all participants if the meetings were spread out over the week rather than condensed by main force into three or four days. Unconsciously, no doubt, societies have contributed to this pressure by the very precise instructions given secretaries in regard to the dates for holding sessions. If these officers were allowed some liberty in adjusting the precise time for the meetings of a given society it would not be difficult by conference to improve conditions materially and thus add to the comfort as well as to the effectiveness of the meetings.

A NEW FEATURE

In recent years members have often expressed the desire that some definite effort be made to bring together for general programs those attending association meetings. The evening general sessions are necessarily somewhat formal, and the increase in conflicting events has further reduced their influence and association-wide participation. The multiplication of separate meetings and technical programs, essential and wise as it unquestionably is, may meet all the needs and desires of many members. Yet others feel clearly the importance of developing opportunities for general contacts and united consideration of some scientific problems. The week set aside for meetings at Atlantic City has furnished the opportunity for offering to the members in attendance two unique privileges which will bring members together in a manner not heretofore provided.

Friday, January 1, has been selected by the Executive Committee as Association Day, and provisions made for a series of exceptionally attractive events on the day's program. Some societies have already planned to extend their meetings over at least the morning of Friday. In addition thereto various con-

ferences are to be held; the largest of which thus far announced is the Secretaries' Conference, referred to elsewhere in this account. Boards of scientific institutions and projects are planning to use this time for official meetings. This will avoid conflicts with important scientific programs in the earlier days of the week and give freedom from pressure in considering the business entrusted to these organizations.

On Friday at noon an association luncheon will be served in Haddon Hall. All members of the association are invited to participate. It is expected that a distinguished foreign scientist will speak on this occasion. Further details will be given in a later announcement. On Friday afternoon the Section on Medical Sciences will present a general lecture of interest to all scientists. The speaker will be Dr. Walter Schiller, of Vienna, who will speak on the changes in the conception of cancer. The progress made in technical study of cancer along numerous lines which have been developed through intensive recent work will have been presented before the Section on Medical Sciences in earlier programs during the week. Thus this address of Dr. Schiller, which will present a broad survey of the situation, is planned to orient scientists with reference to the progress already achieved and the hopes of the future.

For Friday evening a unique program of scientific films is being prepared, and details of this feature will be announced shortly.

The American Philosophical Society, one of the oldest, most widely known and most influential of American scientific organizations, has invited the association to adjourn its sessions to Philadelphia for Saturday. Members will be met at the train from Atlantic City on Saturday morning and taken to the rooms of the Philosophical Society. Scientific programs will be given there and probably also at the Franklin Institute and the Academy of Natural Sciences in Philadelphia. One such session on viruses and virus diseases is already assured. Following the symposia there will be a complimentary luncheon for the members of the association, and this will be followed by visits to various scientific institutions in Philadelphia, which will keep open house on this occasion.

SECTIONAL AND SOCIETY PROGRAMS

The Section on Mathematics (A) will hold meetings on Monday and Tuesday afternoons. The retiring vice-president, Professor T. H. Hildebrandt, will deliver his address on the topic, "Recent Developments in the Theory of Integration," at 2:00 on Tuesday afternoon. Professor G. C. Evans, chairman of the section, will preside. The American Mathematical Society and the Mathematical Association of America will meet during this week at Duke University to recog-

nize the founding by that institution of a new mathematical publication and to make arrangements for its management. Some members will be able to attend both meetings. The societies are to be congratulated on planning to give due prominence to the important action taken by Duke University.

The Section on Physics (B) will hold its meeting jointly with the American Physical Society and the American Association of Physics Teachers. The joint session will probably be held on Tuesday morning, at which time Dr. John T. Tate will present his address as retiring vice-president of the section and Dr. F. K. Richtmyer will give the presidential address of the American Physical Society. It is expected that the dinner will also be a joint one with the Physical Society and the Association of Physics Teachers. It is proposed to hold it on Tuesday evening. Other meetings of the American Physical Society will be held on Monday, Tuesday and Wednesday. One of the sessions will be a symposium on radiology in which a number of papers will be presented on the subject of radiant energy in the treatment of disease and other applications.

The American Association of Physics Teachers will cooperate with the American Physical Society and the Section on Physics in a joint meeting on Wednesday. The program of this joint meeting will be sent out by the secretary of the American Physical Society. The organization will in addition thereto hold a program of contributed papers on Thursday, which will consist of reports of standing committees and the election of officers for another year.

The American Meteorological Society will meet on Monday, Tuesday and Wednesday. Weather variations and long-range forecasting will be the subject of a joint session with the Section on Astronomy on Wednesday afternoon. J. B. Kincer's presidential address on Tuesday will be on "The National Loss from Hail, Windstorms, Drought and Other Weather Vagaries." In the science exhibition there will be a special collection of modern meteorological apparatus, including prototypes, leading up to the radio-meteorograph, of which there may be one or more demonstration ascents by unmanned balloons in the course of the meeting.

Sigma Pi Sigma, Physics Honor Society, will have its luncheon, held annually with the mid-winter meeting of the association, on Wednesday.

The Section on Chemistry (C) will hold sessions on Tuesday and Wednesday. On Tuesday afternoon there will be a joint session of this section with the Section on Education and with the cooperation of the Division of Chemical Education of the American Chemical Society for the third of a series of three symposia on the relationships of chemistry to education. The subject

of this symposium will be "The Preparation of the Teacher of Chemistry." Both chemists and educators will present their respective points of view and these will be discussed. On Wednesday afternoon Professor M. Gomberg will deliver his retiring vice-presidential address on the topic, "Reducing Potential of Free Radicals." Sessions for contributed papers will be held on Tuesday and Wednesday mornings. In these the Delaware, Philadelphia, Princeton and South Jersey Sections of the American Chemical Society are cooperating. On Wednesday at noon the honorary chemical fraternity, Phi Lambda Upsilon will hold a luncheon.

The Section on Astronomy (D) will hold meetings on Wednesday and Thursday. The session on Wednesday afternoon will be a joint session with the American Meteorological Society at which questions relative to climatic variations and weather predictions will be discussed. The vice-presidential address by Dr. W. R. Morgan, chairman of the section, is scheduled for the section meeting on Thursday.

Another astronomical exhibit is being arranged in connection with the general program of educational exhibits. The cooperation of all observatories and other institutions having astronomical material that could be effectively displayed is solicited in this connection. Correspondence relative to material to be exhibited should be addressed to the secretary of the section.

The Section on Geology and Geography (E) will meet for the reading of papers during the forenoon and afternoon of Thursday and Friday. This schedule makes it possible for members of the Geological Society of America to attend the gathering of geologists in Cincinnati prior to the sessions at Atlantic City. The sessions on Thursday will be devoted largely to the presentation of papers dealing with the geomorphology, paleontology, stratigraphy and economic geology of the Atlantic Coastal Plain. Other papers of interest to geologists and geographers will for the most part be scheduled for the Friday sessions.

The Section on Zoological Sciences (F) will hold joint sessions with the American Society of Zoologists on Tuesday, Wednesday and Thursday. The session of Tuesday morning will be devoted to the reading of papers. In the afternoon there will be a symposium on experimental populations. Special discussion sessions will be devoted to problems of cellular physiology, biological effects of radiation and on genetics and embryology. One session will be given over to demonstrations. All demonstrations, exhibits and meetings will be held in the Municipal Auditorium unless otherwise announced.

The business meeting of the section will be held on

Wednesday immediately preceding the business meeting of the zoologists.

The zoologists' dinner will be held on Wednesday evening, following which Professor Ross G. Harrison, vice-president of the Section on Zoological Sciences, will deliver the vice-presidential address.

The Section on the Zoological Sciences will meet jointly with the American Society of Zoologists on Tuesday, Wednesday and Thursday. On Tuesday morning there will be section meetings for reading of papers. In the afternoon there will be a joint symposium with the Ecological Society of America on experimental populations under direction of Dr. W. C. Allee and at which papers will be given by Dr. W. H. Johnson, Dr. Thomas Park, Dr. A. M. Banta and Dr. Raymond Pearl. The biologists' smoker will be held that evening. On Wednesday morning the regular program will be continued and there will also be a joint session with the Genetics Society of America and a program of invited speakers on genetics and embryology. The annual business meeting will be held that noon. The afternoon will be devoted to demonstrations.

The regular sessions will be concluded on Thursday morning. In addition to the special features mentioned above there will be two special sections with invited speakers, one arranged by Dr. Robert Chambers and Dr. M. H. Jacobs on "Properties of Protoplasmic Surfaces," and the other arranged by Dr. W. C. Curtis on "Biological Effects of Radiation."

The Entomological Society of America will meet on Monday and Tuesday. A joint symposium on the subject, "Insects in Relation to Man," will be held by the Entomological Society of America and the American Association of Economic Entomologists on Monday afternoon. The annual business meeting of the Entomological Society of America will be held on Tuesday afternoon. On Tuesday evening the two entomological societies will attend the Entomologists' Banquet sponsored by the American Association of Economic Entomologists. This will be followed by the annual address of the Entomological Society of America to be given by Dr. Edith M. Patch, entomologist of the Maine Experiment Station.

The American Association of Economic Entomologists will meet on Monday morning opening with the Section of Apiculture. The first general session will meet at noon with the president's address. After lunch there will be a joint session with the Entomological Society of America. This will be a symposium on "Insects Affecting Man." The Extension Section and the Executive Committee will each meet on Monday evening. Tuesday will be devoted to a business session in the morning and a paper reading session in the afternoon. The Entomologists' dinner and the public

address by Dr. Edith M. Patch, of the Entomological Society of America, will come that evening. This dinner is a joint affair of the two entomological societies. On Wednesday will be held the first session of the Plant Quarantine Section and a continuation of the paper reading session of the general association. The final business session will be held on Thursday afternoon.

The American Society of Parasitologists will hold its meetings on Tuesday, Wednesday and Thursday. The Wednesday morning session will include the presidential address of Professor Robert W. Hegner. The demonstration session on Wednesday morning will be followed by the annual luncheon and business meeting at midday. The Tuesday and Thursday program will be devoted to contributed papers by members of the society.

The Section on Botanical Sciences (G) will meet in joint session with the Botanical Society of America, the American Phytopathological Society, the American Society of Plant Physiologists and the Mycological Society of America on Tuesday afternoon. The retiring vice-presidential address by Dr. E. W. Sinnott, of Columbia University, on "Morphology as a Dynamic Science," will be followed by a symposium on "Recent Developments in Plant Sciences." Dr. W. M. Stanley, of the Rockefeller Institute, will discuss chemical studies on the virus of tobacco mosaic; Dr. E. J. Lund, of the University of Texas, will speak on electric polarity in plants, and Dr. Annie M. Hurd Karrer, of the U. S. Department of Agriculture, will give an address on selenium in plants.

The Botanical Society of America plans joint sessions as follows: (1) with the Section on Botanical Sciences and affiliated societies on Tuesday afternoon; (2) with the Ecological Society of America on Wednesday afternoon, and (3) with the American Society of Naturalists and affiliated societies on Thursday afternoon. The Physiological Section of the society will hold a joint session with the American Society of Plant Physiologists and the American Society for Horticultural Science on Wednesday forenoon. Meetings of the sections of the society will occupy the forenoons. The annual dinner of the society will be held on Wednesday evening, following which the presidential address will be given by Professor Aven Nelson, of the University of Wyoming.

The American Phytopathological Society will meet from Monday morning through Thursday afternoon under the presidency of Dr. G. H. Coons, Bureau of Plant Industry, U. S. Department of Agriculture, who will deliver an address on "Progress in Plant Pathology." In addition to the usual program of research papers, round-table conferences are to be held on the following: Plant Quarantines and Control Campaigns

against Introduced Plant Diseases, with an address by Lee A. Strong, chief of the U. S. Bureau of Entomology and Plant Quarantine; Coordination of Research and Extension Work with special reference to Orchard Spray and Dust Injuries, Plant Disease Survey work. Joint meetings will be held with Section on Botanical Sciences on Tuesday afternoon, with the Mycological Society of America and the Genetics Society of America on Thursday morning, and with the Potato Association of America on Thursday afternoon. The annual Phytopathologists' Dinner will be held on Tuesday evening.

The American Society of Plant Physiologists plans joint sessions as follows: (1) with the section on Botanical Sciences and affiliated societies on Tuesday afternoon; (2) with the American Society for Horticultural Science and the Physiological Section of the Botanical Society on Wednesday forenoon, and with the Ecological Society of America on Thursday afternoon. A symposium on photosynthesis, with special reference to carbon assimilation and plant growth, will be held on Thursday forenoon. Dr. H. A. Spoehr, of the Carnegie Institution, will preside as chairman at this session. The society will hold its annual banquet on Tuesday evening, at which Dr. A. E. Murneek will give the retiring president's address. At this time also the Charles Reid Barnes life membership and Stephen Hales prize awards will be announced.

The Mycological Society of America will meet from Tuesday to Thursday, inclusive. At the close of the business session on Tuesday morning the retiring president, Professor H. M. Fitzpatrick, will speak on the historical background of the Mycological Society. A joint session with the Section on Botanical Sciences will be held on Tuesday afternoon and another with the American Phytopathological Society on Thursday morning. The balance of the sessions will be given over to the reading of papers dealing with the cytology, biology and taxonomy of fungi, also the relation of fungi to diseases in man. The society will join with the American Phytopathological Society and the Botanical Society of America in the dinners held by these affiliated organizations.

The American Fern Society will meet on Friday morning. There will be a symposium on the ferns of New Jersey, illustrated by specimens exhibited in the meeting room. If weather permits, a trip may be taken in the afternoon to see several ferns in their native habitat.

The Sullivant Moss Society will meet jointly with the Section on Botanical Sciences on Tuesday and will hold a session for individual reports on Thursday morning.

The American Society of Naturalists will sponsor the Biologists' Smoker on Tuesday evening. On Wednesday morning the society will join with the American

Society of Zoologists and the Genetics Society of America in a discussion session on "Genetics and Development." The Naturalists' Symposium will be held on Thursday afternoon under the joint sponsorship of the American Society of Naturalists, the American Society of Zoologists, the Botanical Society of America, the Genetics Society of America and other biological societies. Its subject will be "Superspecific Variation from the Viewpoints of Biology and Paleontology," with a zoologist, a botanist and a paleontologist as principal speakers. The dinner of the society will be on Thursday evening followed by the address of its president, Professor C. E. Allen, professor of botany at the University of Wisconsin, on "Haploid and Diploid Generations."

The Ecological Society of America has arranged a program to occupy four days, beginning on Tuesday with a general session in the morning. For Tuesday afternoon the society is holding a joint symposium with the American Society of Zoologists on the subject of "Experimental Populations," with Dr. W. C. Allee as chairman and the following speakers taking part in the program: Dr. Willis H. Johnson, on "Experimental Populations of Microscopic Organisms"; Dr. Thomas Park, on "Experimental Studies of Insect Populations"; Dr. A. M. Banta, on "Population Density as Related to Sex and to Evolution in Cladocera," and Dr. Raymond Pearl, on "Biological Principles Affecting Populations: Human and Otherwise." The annual dinner will be held on Tuesday evening, following which an address will be given by the president of the Ecological Society, Dr. W. S. Cooper. Tentative arrangements have been made with Dr. John A. Small, the local representative of the society for the Atlantic City meeting, to show a colored film of New Jersey pine barrens vegetation, following the presidential address. On Wednesday afternoon the society has planned a joint session with the Botanical Society of America. Arrangements are being made to hold a joint symposium with the American Society of Plant Physiologists, the Society of American Foresters and the Wildlife Society. Details of these meetings, as well as further general sessions and business meetings, will occupy Wednesday morning and Thursday morning and afternoon. A field trip is scheduled for Friday to the Cape May Peninsula, the oyster experiment station and the Witmer-Stone Wildlife Sanctuary.

The Genetics Society of America is arranging again the type of program instituted last year in which short formal papers are omitted and their place is taken by informal demonstration papers. Demonstration sessions will be held on Tuesday morning and afternoon, and together with the American Society of Zoologists on Wednesday afternoon. On Wednesday morning there is scheduled a joint discussion session with the

American Society of Zoologists and the American Society of Naturalists dealing with "Genetics and Development." On Thursday forenoon there will be held jointly with the American Phytopathological Society a round-table conference on "Development of Resistant Strains in Animals and Plants." The annual luncheon is scheduled for Wednesday and will be followed by a business meeting.

The Limnological Society of America will hold its second annual meeting in conjunction with the association. It is planned to have at least two general sessions for the reading of papers, an annual business meeting and possibly a joint program with the Ecological Society of America.

The American Nature Study Society will meet on Tuesday, Wednesday and Thursday. On Tuesday the program will be devoted to the discussion of camps, trails, museums, gardens, visual education, woodcraft, ranger naturalist and the worth of nature study. On Wednesday the subject of education and science will be presented, with an educator and scientist alternating on the program. In the afternoon of Wednesday, there will be a short business meeting. The banquet will be held on Wednesday evening. On the following day there will be a joint meeting with the Science Teachers Association. An exhibit is being arranged in connection with the general science exhibit of the association.

The American Microscopical Society will hold its annual business meeting on Wednesday at 4:00 P.M.

The Section on Psychology (I) will meet from Monday to Wednesday. In addition to the usual programs of submitted papers, there will be a symposium under the chairmanship of Dr. Leonard Carmichael, University of Rochester, on "The Cortex and Behavior." Papers are to be read by Dr. Philip Bard, the Johns Hopkins Medical School; Dr. J. G. Dusser de Barenne, Yale University Medical School; Dr. K. S. Lashley, Harvard University; and Dr. R. Lorente de No, Central Institute for the Deaf. Each paper will be discussed by other active investigators in the fields of physiology and psychology. On Tuesday evening there will be a joint dinner of the Section on Psychology and the Section on Education, at which addresses will be given by Professor R. M. Ogden, of Cornell University, retiring vice-president of the Section on Psychology, on "The Psychology of Art: Naïve Geometry," and by Professor F. B. Knight, of the State University of Iowa, retiring vice-president of the Section on Education, on "Data Related to Classroom Learning." In addition to the foregoing, an unusually full program of submitted papers is being planned.

The Section on Social and Economic Sciences (K) will hold sessions on Wednesday, Thursday and pos-

sibly Friday. The Econometrists will not meet with the first-named section at Atlantic City; they are planning an extensive program for the meeting at Denver in June, 1937. One session at Atlantic City will be devoted especially to papers on social research. The address of the vice-president and chairman of the section, Dr. Shelby Harrison, director of the Russell Sage Foundation, will discuss significant problems of the present day in that field. The Section on Social and Economic Sciences plans joint sessions with the Section on Historical and Philological Sciences.

The Section on Historical and Philological Sciences (L) will hold meetings on Wednesday and Thursday. Joint sessions are being arranged with the Sections on Anthropology and on Social and Economic Sciences. The program will center upon the history of science and medicine and practical effects with respect to modern times. On the program will be Dr. George Sarton, of Harvard University; Watson Davis, director of Science Service; Dr. A. Pogo, specialist in Egyptian and Mayan astronomy; Dr. Joseph Mayer, consultant at the Library of Congress; and a number of other speakers who will represent various phases of the general topic. Dr. George Sarton, the retiring vice-president, will give an address which should be of interest to many of the scientists present at the Atlantic City meeting, on "The Study of the History of Twentieth Century Science." The joint program with the Section on Social and Economic Sciences will probably have as its principal address a paper on "The Influence of Science upon Modern Business," by Dr. Joseph Mayer.

The program of the Section on Engineering (M) is not fully determined. A later announcement will appear in *SCIENCE*. The sub-section on aeronautics, represented by the Institute of the Aeronautical Sciences, will hold a session on Tuesday morning, at which the subject of the speed possibilities of aircraft will be considered by aeronautical specialists. Mr. T. P. Wright, director of engineering of the Curtiss-Wright Corporation, will deliver a paper on "Speed and the Airplane." The limiting factors of the speed of airplanes when they approach speeds of five and six hundred miles an hour in terminal dives are coming to be a practical question for designers. These, with the possibility of achieving such speeds in regular flight in the stratosphere, will be discussed.

The Section on Medical Sciences (N) is planning to hold sessions on Monday afternoon and on Tuesday, Wednesday, Thursday and Friday at Atlantic City, also on Saturday morning in Philadelphia. This section has arranged a comprehensive symposium on cancer consisting of seven sessions. The first session on Tuesday morning will be devoted to questions concerning radiation and the afternoon session to various

aspects of the relationship of heredity and constitutional factors to the occurrence of tumorous growth. The two sessions on Wednesday will be concerned with the induction, stimulation and inhibition of tumors. This will involve a consideration of the carcinogenic substances, the relationship of the sex hormones and the significance of viruses and of inhibitory substances to the etiology and development of tumors. On Thursday morning tissue culture work in connection with cancer will be discussed and the metabolism of cancerous tissue will be considered. In addition two general lectures on Thursday afternoon and on Friday will take up certain more general aspects of the cancer problem. The section has brought together the leaders in the various fields in order to call attention to the fundamental work going on in this country in the investigation of this serious problem and to afford an authoritative survey of the actual status of this field.

The two general papers will be given by Dr. C. C. Little, of the Roscoe B. Jackson Memorial Laboratory, and Dr. Walter Schiller, of the University of Vienna. Dr. Little will present a general lecture for the entire association at 4:30 on Thursday on the social significance of cancer. Dr. Schiller will lecture at 4:30 on Friday afternoon on changes and modifications in the conception of carcinoma.

The Section on Medical Sciences will hold a joint session with the pharmacy sub-section on Monday afternoon and a session for the presentation of general papers on Friday morning.

As the association is to hold meetings on Saturday at Philadelphia, the Section on Medical Sciences has invited Dr. Wendell M. Stanley, of the Rockefeller Institute at Princeton, to lecture on the tobacco mosaic virus which he has succeeded in crystallizing.

The Sub-section on Dentistry has arranged a program under the auspices of the American Division of the International Association for Dental Research, with the cooperation of the American Dental Association, the American Association of Dental Schools and the American College of Dentists. There will be a morning and an afternoon session on Monday. The program will be representative of a wide field of dental and oral problems.

The Sub-section on Pharmacy will hold one session at the Atlantic City meeting on Monday morning. At this session there will be papers submitted by Dr. Marvin R. Thompson, of the University of Maryland, on studies on digitalis, Dr. Arthur Osol, of the Philadelphia College of Pharmacy and Science, and Dr. Heber Youngken, of the Massachusetts College of Pharmacy. In addition there has been arranged a joint session with Medical Sciences in the afternoon of Monday, at which time the Sub-section on Pharmacy will have presented papers by Drs. Feldman and Krantz, of the University of Maryland, on "The Etiol-

ogy of Gall Stones," and also papers by Drs. Grollman and Carr on "Cortin and Its Effects on the Metabolism of the White Rat."

The Section on Agriculture (O) will hold two sessions devoted to a comprehensive symposium on pasture and forage crops in the Northeastern United States. This program has been arranged by the Northeastern Section of the American Society of Agronomy. The improvement of forage crops is now receiving major attention by all the experiment stations in the northeastern states, and, in a number of projects, assistance is being given by the Federal Government. A special pasture research station is now being developed by the Federal Government in Pennsylvania. Developments within the last decade or two have shown that significant improvements in forage crops are possible and that they would vitally affect northeastern agriculture. A major portion of the investigations have been concerned with quantitative production. Oftentimes incidental to the quantitative studies interesting differences in composition have been revealed. It is the purpose of the symposium to bring together the fragmentary information relating to chemical composition of forage crops, the causes of these differences and their economic significance. The discussions will be led by men who have made notable contributions in reference to forage crop investigations.

Dr. H. B. Sprague, of the New Jersey Agricultural Experiment Station, will review the possibilities for genetic improvement and improvement through introduction and selection of crops for pasture uses. Professor D. B. Johnstone-Wallace, of Cornell University, has introduced many ideas about the management of pastures and will discuss these factors in relation to the chemical composition of pasture plants. The pasture discussions will be continued with a paper on the relation between the chemical composition of plants and fertilizer treatments by Dr. W. H. Pierre, head of the agronomy department of the University of West Virginia. The relation between soils and the chemical composition of pasture crops will be taken up by Dr. A. R. Midgley, of the University of Vermont. Perhaps the difficulty of satisfactory measurement has been the greatest obstacle to satisfactory pasture experimentation. Therefore, a discussion of pasture problems includes a review of the technique of research. This discussion will be presented by B. A. Brown, of the Storrs Agricultural Experiment Station. The most satisfactory stage for cutting silage corn has been the object of many experiments over a period of many years. Dr. R. G. Wiggans, of Cornell University, has thrown new light on these in some recent experiments on the relation between stage of growth and maturity. Dr. Wiggans will describe his investigations.

It is now recognized that laboratory estimations of feeding value of forage crops may be inadequate. A discussion of the interpretation of variations in plant composition in relation to feeding value by Dr. L. A. Maynard, of the Animal Husbandry Department of Cornell, is, therefore, the fitting climax for the discussions.

The American Society of Agronomy will meet jointly with the Section on Agriculture and participate in the symposium just described.

The American Society for Horticultural Science will hold sessions on Tuesday, Wednesday and Thursday. This society will hold a joint meeting with the Potato Association of America on Tuesday afternoon, and a joint meeting with the American Society of Plant Physiologists and the physiology section of the Botanical Society of America on Wednesday forenoon for a symposium on the general theme of minor elements, under the chairmanship of Dr. E. J. Kraus, of the University of Chicago. Papers will be presented at this meeting by Dr. W. H. Chandler, of the University of California; Dr. O. F. Curtis, of Cornell University; Dr. G. T. Nightingale, of Honolulu, Hawaii, and Dr. J. E. McMurtrey, of Washington, D. C.

The banquet will be held on Wednesday evening, at which Professor Alex Laurie, of Ohio State University, will give the address of the president of the society, and at which a special moving picture film of interest to the scientific group will be shown.

The Potato Association of America plans joint sessions with other organizations as follows: (1) with the American Society for Horticultural Science on Tuesday afternoon; (2) with the American Phytopathological Society on Thursday afternoon. The committees on Nomenclature, Certification, Breeding, Standardization of Field Plot Technique, Standardization of Cooking Tests, Culture and Storage, Fertilizer Investigations, Virus Diseases and Insects will present reports. Among those who will take part in the program are E. V. Hardenburg, C. F. Clark, Ora Smith, G. F. MacLeod, Julian C. Miller, J. R. Livermore, F. A. Krantz, F. J. Stevenson, B. E. Brown, H. A. Jones, Donald Reddick, L. M. Ware, C. L. Fitch, E. O. Mader.

The Section on Education (Q) plans three sectional meetings, a joint program and the annual dinner with the Section on Psychology. The central theme of the program on Monday morning will be "Individual Differences and Provisions for Them," and of the afternoon program "Current Curriculum Problems." In the case of each program, two major papers will be presented, followed by briefer reports of studies by fellows and members. The Tuesday morning program will be devoted entirely to reports of experimental studies by fellows and members. On Tuesday afternoon, a joint meeting will be held with the Section on Chemistry and the Division of Chemical Education of the American Chemical Society on the topic, "The Preparation of Teachers of Chemistry." Papers will be presented by J. H. Simons, secretary of the Section on Chemistry, and William S. Gray, secretary of the Section on Education, reflecting the points of view of both chemists and professional educators. The discussion of these papers will be introduced by Professor Ralph Powers, of Teachers College, Columbia University, and Professor Ross A. Baker, of the College of the City of New York. The annual dinner of the Section on Psychology and the Section on Education will be held on Tuesday evening, at which time the retiring vice-presidents of the two sections will present papers: "Data Related to Classroom Learning," by F. B. Knight, and "The Psychology of Art: Naïve Geometry," by Robert M. Ogden.

GENERAL ANNOUNCEMENTS

The Society of the Sigma Xi will hold its thirty-seventh annual convention on Tuesday. The executive committee will meet at two o'clock. The business session will convene at four o'clock and the fifteenth annual lecture, given under the joint auspices of the association and the society, will be the address of the Tuesday evening general session. Dr. Henry G. Knight is the speaker.

The American Association of Science Teachers will meet on Thursday morning and afternoon.

Announcements regarding places and hours of various events will be given in the printed program of the meeting. This pamphlet will be distributed on registration at Atlantic City.

OBITUARY

HOWARD McCLENAHAN

AMONG those to whose lot it falls to form and guide the policies of men, few have that opportunity, which is afforded the dean of a great college, to combine the abstract expression of their ideals with the influence of personal contact. It is the happy lot of such men to see their cherished ideals born and reborn of their teaching in an ever-widening field of influence, extending even beyond the generation in which they live.

Many there were to whom the death of Howard McClenahan on December 17, 1935, came as a loss which was not merely that of a teacher from whom they had learned much in their earlier days; for in his death they saw the passing of that fountain of influence whose loss was more for the generations to come than for themselves, in whom the fruits of his example had already spread their foliage as a lasting memorial.

Howard McClenahan was born on October 19, 1872, at Port Deposit, Maryland. He was the son of John Megredy McClenahan and Laura Jane (Farrow). He graduated from Princeton University with the degree of E.E. in 1895 and the degree of M.S. in 1897. He received honorary degrees from Washington College, Maryland (LL.D., 1907), from Swarthmore College (LL.D., 1929), from Franklin and Marshall College (Litt.D., 1929), from Union College, Schenectady (Sc.D., 1931) and from the University of Pennsylvania (D.Sc., 1931). He became instructor in physics at Princeton University in 1897, assistant professor of physics in 1902 and full professor in 1906, which position he occupied until he left Princeton in 1925. In 1912 he was appointed dean of the College of Princeton University. He resigned the deanship in 1925 to assume the secretaryship of The Franklin Institute, which position he occupied until his death, combining with it in the last two years of his life the directorship of the Benjamin Franklin Memorial and Franklin Institute Museum.

The two phases of Howard McClenahan's life for which he will be chiefly remembered are those associated with his deanship at Princeton University and those having to do with his work in The Franklin Institute. As a dean, he was characterized by those who knew him as a man of particularly broad sympathies in understanding the weaknesses as well as the strengths of those with whom he had to deal. He had the characteristics of an Irishman in not shrinking from the fight when the cause was well deserved. He always struck fairly and was in an unusual degree free of prejudice and influence by personal feelings rather than the logic of the situation. He was a good strategist, but while adaptable in matters of policy, he was fearless in those of principle.

In the administration of his deanship, he came up against those situations in which he had to weigh the dignity and ethical principles at stake in matters pertaining to collegiate athletics against the powerful influence of alumni whose love for their university was perhaps no less than his but who thought to demonstrate it through channels which he could not approve. In these matters he proved stronger in his principles and in the recognized principles of intercollegiate athletics than the administration found it expedient to be. Although, therefore, his formal association with Princeton became severed, his love for his alma mater never weakened, and he was always ready with his influence and support for all that tended to her good.

A former close associate of McClenahan describes one of his finest attributes as his continuing faith in young men, and his striving to help them develop their own powers of self-confidence, judgment and especially integrity of character. He was strict in disci-

pline, but he tempered judgment with understanding. He was regarded with affection by his old students and, even to the day of his death, he was known to most of them as "the Dean."

Howard McClenahan came to The Franklin Institute at that critical period when, having built up a long tradition of valuable service to science through its *Journal*, its lectures and other activities, the institute was feeling the urge to expand its activities and increase its potentialities. A priceless library had been accumulated, and McClenahan early saw the need of housing these precious books in more suitable quarters than those of the institute's old building at Seventh Street. The idea, already in the minds of the officers of the institute, of a new building centering upon the Parkway began to take form; but McClenahan visioned something far more ambitious than a mere transference of the institute activities to another center. It became his earnest ambition to create in Philadelphia a great museum of science after the pattern of the Deutsches Museum of Munich. The undertaking was one of stupendous proportions, not only financially but administratively. It was McClenahan who built up the friendly relations with the Poor Richard Club, through the Benjamin Franklin Memorial Incorporated, in its efforts to build a memorial to Benjamin Franklin, and it was his idea that the museum which he had so vividly in mind should become an important part of this memorial. With untiring energy, McClenahan succeeded in presenting his views to the public with such success as to result in raising five million dollars, so that he was enabled to put his ideas into operation and bring to a successful completion that monument of science which now adorns the Parkway. In an incredibly short period, the personnel of the new museum was chosen, the plan of procedure formulated, the details of all the various exhibits were worked out, first in broad and then in detailed manner, until finally the dream of a working entity serving the needs not only of Philadelphia but of the nation was realized.

At the time when Howard McClenahan came to The Franklin Institute, the Bartol Research Foundation was housed in temporary quarters on North Nineteenth Street, but was without a director and no systematic work had been started in its laboratories. A committee had been created to formulate the policy of the foundation, and McClenahan, in cooperation with this committee, was largely responsible for bringing the Bartol Foundation into a condition of a working entity, by the appointment of a director and by the subsequent erection of a suitable laboratory quarters at Swarthmore.

While engaged upon these newer activities of the institute, McClenahan continued to guide, foster and develop all those older activities which had become

traditionally associated with the institute's work. He was editor of the institute's *Journal*, and worked ceaselessly to improve its standards. He reorganized the institute's technique for the award of honors in such manner that a single Medal Day was designated for the year, on which occasion all the honors were bestowed. This act served to increase the importance and value of the occasion, and to create one day in the year when the institute has an opportunity to review its activities, cement acquaintanceship among its members and bring its works before the public eye.

Soon after McClenahan took up his duties at Philadelphia, the Mapes Dodge Lectures were founded. These lectures, which are given at Christmas, and are intended primarily for children, have come to be an annual event of a most pleasing, entertaining and instructive kind. In these lectures doubtless many a youth has received his first inspiration in the mysteries of science.

A man of McClenahan's background could not lose interest in scholastic affairs, even with the severance of his official relation with his old university; and Philadelphia found the benefit of his experience in his activities on the school board and as a member of the board of trustees of the University of Pennsylvania.

McClenahan married Bessie L. Lee, in 1899. He had three children, John Megredy, Richard Lee and Elizabeth Lee. During the last year of his life he suffered in health; and it is undoubtedly as a result of his untiring and enthusiastic devotion to the ideals of his work at The Franklin Institute that his end was hastened. Happily he lived to see the realization of those ideals and the creation of a monument, which will always remain in part a monument to his memory.

W. F. G. SWANN

HENRY BENJAMIN HEDRICK

DR. HENRY B. HEDRICK, astronomer and mathematician, died suddenly of a heart attack at his home in Washington, D. C., on October 6, 1936. Dr. Hedrick was born in Washington on July 22, 1865, and attended school there, taking his A.B. degree at Columbian College, now George Washington University, in 1886. In November of that year he was appointed to the staff of the Nautical Almanac Office in the Navy Department.

While in the Almanac Office, which became a part of the U. S. Naval Observatory organization after 1894, he assisted Professor Simon Newcomb in the preparation of his "Catalogue of Fundamental Stars," and was highly commended for the valuable assistance he gave that work. The major work of Dr. Hedrick, and the one most associated with his name, was a Catalogue of Zodiacal Stars. This had the distinction of being the only one of its kind to be adopted by all

national almanacs, and it has been used as a standard for over 30 years.

In 1910 Dr. Hedrick was called to Yale University to assist Professor E. W. Brown in preparing the "Tables of the Motion of the Moon," a monumental project upon which he was engaged for nine years. In the introduction to the Tables Professor Brown states: "He (Dr. Hedrick) has prepared and tested all calculations which were performed by others. Many of the devices which have been employed to simplify the use of the Tables are due to him, and no decisions have been made without frequent discussions in which his suggestions have given valuable aid. His familiarity with known methods of computation and ability to devise new ones have contributed in no small degree to such novel and useful features as the Tables may be found to possess."

While at Yale Dr. Hedrick received the degrees of A.M. and Ph.D. During the world war he acted as navigating officer in the Yale Naval Training Unit. He was elected to the honorary society of Sigma Xi in recognition of his scientific achievements.

Returning to Washington at the close of the war, he spent two years with the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. In 1920 he became chief ballistician at the Army Proving Ground, Aberdeen, Maryland, where he prepared several volumes of ballistic tables. He retired in 1932.

Dr. Hedrick was the author of several mathematical tables, notably "Tables of Interpolation," published by the Carnegie Institution, and of many articles in *Monthly Notices* and the *Coast Artillery Journal*. He was a member of the American Association for the Advancement of Science, the American Astronomical Society, the Washington Philosophical Society, the Yale Club of Washington, the District of Columbia Chapter of the Sigma Xi and several civic and social organizations.

Dr. Hedrick was a scholar unassuming as to his achievements; a friend sincere and true; and a good man, of kindly disposition, appreciating the essentials of life.

He is survived by his widow, Hannah F. (Mace) Hedrick, who has been a member of the staff of the Nautical Almanac Office since 1894. They were married in 1896 and have a son and two daughters.

H. R. MORGAN

U. S. NAVAL OBSERVATORY

RECENT DEATHS

DR. STARR FORD, professor of medicine at the University of Cincinnati Medical College, died on November 17 at the age of seventy-one years.

MONTROSE W. HAYES, principal meteorologist and head of the River and Flood Division of the Weather

Bureau since 1929, died on November 16 at the age of sixty-two years. Mr. Hayes was one of the organizers of the hurricane warning service in the West Indies and of the national weather forecasting service in Argentina.

DR. H. R. BRITON-JONES, professor of mycology and dean of the college at the Imperial College of Tropical

Agriculture since April, 1926, died at Trinidad on November 4.

DR. C. H. SAMPSON, principal of Brasenose College, Oxford University, died on November 5 at the age of seventy-seven years. Dr. Sampson was appointed senior tutor at the college in 1894. He became principal in 1920.

SCIENTIFIC EVENTS

RESEARCH FOUNDATION OF THE OHIO STATE UNIVERSITY

ORGANIZATION of the Ohio State University Research Foundation was announced on November 3 as incorporation articles were filed in the office of Secretary of State George S. Myers. The incorporators are:

Charles F. Kettering, Dayton, president of General Motors Research Corporation.

James F. Lincoln, Cleveland, president of Lincoln Electric Company.

Charles E. MacQuigg, metallurgical engineer and manager of the Union Carbide and Carbon Research Laboratories, Long Island City, N. Y.

Julius F. Stone, chairman of the university's board of trustees, a Columbus industrialist.

Charles F. Michael, Bucyrus, president of Ohio Locomotive Crane Company and president of Ohio Manufacturers' Association.

Hurlbut S. Jacoby, director of industrial research at the Ohio State University since January 1, 1935, is named as the corporation's agent.

Articles of incorporation set forth that the corporation is not for profit, and it is added that none of the incorporators and those to be announced later as "members" of the corporation will receive remuneration in the form of royalties or other compensation resulting from the foundation's activities.

Mr. Jacoby has made the following statement:

The basic objective of the foundation is to provide an instrument with which the university can work in closer relationship with industries, especially those of Ohio, in solving their research problems.

Existing university research agencies, such as the Engineering Experiment Station, have been doing important work, and they will continue to do so. But many of the problems of industrial research to-day overflow into scientific areas outside the field of engineering proper.

It is believed and hoped that the proposed research foundation, through cooperative arrangements with concerns wanting research done and the revenues secured in this way, will be able to assist also in types of research other than industrial.

So-called "pure research" in chemistry and physics,

for instance, may bring discoveries not immediately useful to industry but of greatest importance a little later.

The organization rests upon five classes of membership, each class choosing three directors. The 15 directors will be the managing group, responsible for the progress of the foundation and its work. The five classes are:

1. Industrial counsellors, 10 to be selected from the membership of Ohio industrial organizations, such as the Ohio Manufacturers' Association.

2. National counsellors, 10 to be selected from membership of the American Engineering Council and the National Research Council.

3. Alumni members, 10 to be selected from the ranks of Ohio State graduates manifesting particular interest in research and who have attained distinction in that field.

4. Trustee members, the seven university trustees as individuals being members *ex officio*.

5. Research members, including *ex officio* these persons having to do with research at the university or in closely allied agencies; deans of all colleges; director of the Engineering Experiment Station; director of the Bureau of Educational Research, director of the Bureau of Business Research, director of the Ohio Agricultural Experiment Station at Wooster, director of the Franz Theodore Stone Laboratory on Gibraltar Island, Lake Erie.

The first annual Industrial Research Conference at the university was held on November 6. The speakers included Charles F. Michael, president of the Ohio Manufacturers' Association; David E. Ross, of the Purdue University Research Foundation; J. L. Morrill, vice-president of the university; James Hurlbut Jacoby, director of industrial research, the Ohio State University, and Julius F. Stone, chairman of the board of trustees. At the banquet in the evening the principal speakers were: Dr. Charles F. Kettering, of the General Motors Company, and Dr. George W. Rightmire, president of the university.

COAL RESEARCH

A GROUP of technical men drawn chiefly from the coal and railroad industries will meet at the Carnegie Institute of Technology on December 3 to hear mem-

members of the Coal Research Laboratory give reports which will interpret the work done by the organization and its meaning to the industry.

Following the technical discussions, Dr. Thomas S. Baker, president emeritus of the Carnegie Institute of Technology, the founder of the laboratory, will give a dinner in honor of Myron C. Taylor, chairman of the board of the United States Steel Corporation, and one of the original sponsors of the laboratory. The dinner will be attended by representatives of the Buhl Foundation, the largest contributor to the laboratory, and of firms supporting the research organization, executives of coal companies and of coal-carrying railroads.

The technical discussions will take place in the theater of the College of Fine Arts. Dr. Robert Ernest Doherty, now president of the Carnegie Institute of Technology, will deliver an address of welcome before the assembled delegates. Three papers reporting the activities of the coal laboratory will be given by members of the staff. William B. Warren will explain "The Relation of the Work of the Laboratory to Practical Carbonization." M. A. Meyers will speak on "The Combustion of Solid Fuel." During the afternoon session Dr. H. C. Howard will deliver a paper on "The Chemistry of Bituminous Coal." These papers will be discussed by experts from industry, including Dr. C. M. A. Stine, vice-president in charge of research for the E. I. du Pont de Nemours and Company.

The Coal Research Laboratory was founded six years ago as the outgrowth of the International Conferences on Bituminous Coal, which were organized by Dr. Baker, when he was president of the Institute of Technology. Three international coal congresses have been held under its auspices. The published proceedings of these meetings are standard reference works on coal and the many by-products derived from it.

In 1928, with the cooperation of Mr. Taylor and of the U. S. Steel Corporation, the Carnegie Institute undertook the organization of the Coal Research Laboratory. Dr. Baker approached the Buhl Foundation of Pittsburgh. The outcome was that in 1930 he was able to announce that \$425,000 had been given for a five-year program of research on coal. Besides the Steel Corporation and the Buhl Foundation, which made the largest contributions, the following companies gave support to the laboratory: The General Electric Company, the Koppers Company, the New York Edison Company, the Standard Oil Company of New Jersey and the Westinghouse Electric and Manufacturing Company. The Carnegie Institute of Technology has also contributed largely to its financial support. Dr. H. H. Lowry, of the Bell Telephone Laboratories, was appointed director of the lab-

oratory and work was begun in 1930. Dr. Lowry chose as the main study for the laboratory "The Mechanism of the Thermal Decomposition of Coal." Working on the several phases of this problem, the staff, which has averaged in number some twenty-three workers, has contributed forty-three papers, and has completed six more and has thirteen in preparation. The original grant to the laboratory has been so administered as to continue the program through the sixth year.

Dr. Baker, after his retirement as president of the Carnegie Institute of Technology in 1935, was appointed chairman of a committee to secure additional funds for the laboratory. Assurance of support has been received from the Steel Corporation and others of the original sponsors of the laboratory, as well as from leading coal companies and coal-carrying railroads.

THE FORTIETH ANNIVERSARY OF DIESEL POWER

THE fortieth anniversary of the introduction of Diesel power into the United States will be observed on December 2 by a distinguished group of 300 leaders in business, industry and engineering, at a luncheon at the Waldorf-Astoria, in New York, arranged by the Diesel Committee of the Exposition of Power and Mechanical Engineering. The date coincides with "Diesel Day" at the Power Show scheduled to open in New York on November 30.

Although millions of Diesel horsepower are installed in the railroads, mines, mills, ships, pumping stations and power houses of the country and millions more employed in mobile units on engineering projects, on farms, in forests and in countless other major industries, the projected luncheon is the first time public interest will have been focused on the progress and importance of the Diesel industry as a whole.

The development of Diesel as a prime motive power has paralleled that of the gasoline engine. The more spectacular application of the latter to automobiles has overshadowed the rapid advance in industrial importance of Diesel. Dr. Rudolf Diesel, Paris-born Bavarian, first recognized and made practical the principles of converting low-grade, low-volatile fuel into power by subjecting it to extreme high compression in an internal combustion engine. His memory will be honored during the brief speaking schedule at the Waldorf luncheon. Part of the program will be broadcast over a coast-to-coast radio network of the National Broadcasting Company.

Gordon Rentschler, president of the National City Bank of New York, is chairman of the Diesel committee. Serving with him are:

Charles F. Kettering, vice-president, in charge of research, General Motors Corporation.

Edward B. Pollister, president, Busch-Sulzer Brothers Diesel Engine Company.
 Colonel Robert H. Morse, president, Fairbanks-Morse and Company.
 B. C. Heacock, president, Caterpillar Tractor Company.
 C. L. Cummins, president, Cummins Engine Company.
 David S. Sarnoff, president, Radio Corporation of America.
 Edward G. Budd, president, Edward G. Budd Manufacturing Company.
 Arthur Brisbane.
 H. L. Hamilton, president, Electro-Motive Corporation.
 Malcolm Muir, president, McGraw-Hill Publishing Company.
 Captain Edward V. Rickenbacker, vice-president, Eastern Air Lines.
 Thomas H. Beck, president, Crowell Publishing Company.
 Walter C. Teagle, president, Standard Oil Company (New Jersey).
 C. A. Crique, Sr., president, Sterling Engine Company.
 B. F. Fairless, president, Carnegie-Illinois Steel Corporation.
 Frank A. Vanderlip, Sr.
 R. U. Blasingame, president, American Society of Agricultural Engineers.

THE TWENTY-FIFTH ANNIVERSARY OF THE NEW YORK STATE COLLEGE OF FORESTRY

THE twenty-fifth anniversary of the founding of the New York State College of Forestry at Syracuse University was observed on November 19, 20 and 21.

Twenty-five years ago the first class in forestry was held in the corner of Lyman Hall, one of the buildings of the College of Liberal Arts. The first classes were directed by the present dean of the Graduate School, Dr. William L. Bray. A few months later Dr. Hugh P. Baker, the first dean of the college, now president of Massachusetts State College, took charge, and from that time it began a remarkable career of development which has been furthered by the late Dean Franklin Moon and by Dr. Samuel N. Spring, the present dean.

There are now two large modern buildings at Syracuse, together with a well-equipped pulp and paper laboratory and various other laboratories. The Roosevelt Wild Life Forest Experiment Station is a part of the college. The large concrete State Ranger School building is situated on the shores of Cranberry Lake in the Adirondacks and 20,000 acres of forest land are used for experimental purposes in various sections of the state. The New York State College of Forestry is the largest and best equipped institution of its kind. To date it has approximately 1,700 graduates, including the Ranger School, a student body of 500 and a faculty of forty-five members.

During the celebration a special convocation was

held at which the doctorate of laws was conferred on Robert Moses, park commissioner of New York City and president of the New York State Council of Parks; on Arno Berthold Cammerer, director of the National Park Service, and on Robert B. Goodman, president of the Northern Hemlock Association.

The program opened on November 19 with a banquet attended by men prominent in the professional field of forestry and education, the alumni and student body. The celebration closed on Saturday, with a meeting of the Alumni Association and a luncheon prior to the Colgate-Syracuse football game.

A history of the college written by members of the faculty has been published and was distributed at the banquet. Speakers during the celebration included: President Hugh P. Baker, of Massachusetts State College; Arno B. Cammerer, director of the United States National Parks; Conservation Commissioner Lithgow Osborne; Robert Moses, chairman of the New York State Council of Parks; Acting Chancellor William P. Graham, of Syracuse University; Robert B. Goodman, chairman of Wisconsin Conservation Commission, and Dean Samuel N. Spring.

ROYAL SOCIETY MEDALLISTS

THE King of England has approved of the following awards this year by the president and council of the Royal Society in respect of the two Royal Medals:

A Royal Medal to Professor R. H. Fowler, F.R.S., for his work on statistical mechanics and allied departments of modern mathematical physics.

A Royal Medal to Professor E. S. Goodrich, F.R.S., for his work on the morphology of the excretory organs of the invertebrata and for his work on the comparative anatomy and embryology of the vertebrata.

The following awards of medals have also been made:

The Copley Medal to Sir Arthur Evans, F.R.S., in recognition of his pioneer work in Crete, particularly his contributions to the history and civilization of its Minoan Age.

The Rumford Medal to Professor E. G. Coker for his researches on the use of polarized light for investigating directly the stresses in transparent models of engineering structures.

The Davy Medal to Professor W. A. Bone, F.R.S., for his pioneer work on contact catalysis and his researches on the mechanism of combustion of hydrocarbons and on the nature of flames and on gaseous explosions.

The Darwin Medal to Dr. E. J. Allen, F.R.S., in recognition of his long-continued work for the advancement of marine biology, not only by his own researches, but by the great influence he has exerted on very numerous investigations at Plymouth.

The Hughes Medal to Dr. W. Schottky for his discovery of the Schrot effect in thermionic emission and

his invention of the screen-grid tetrode and a super-heterodyne method of receiving wireless signals.

The following is a list of those recommended by the president and council for election to the council of the Royal Society at the anniversary meeting on November 30:

President, Sir William Bragg; *Treasurer*, Sir Henry

Lyons; *Secretaries*, Sir Frank Smith and Professor A. V. Hill; *Foreign Secretary*, Sir Albert Seward.

Other Members of the Council—Professor A. J. Allmand, Dr. G. T. Bennett, Professor J. Chadwick, Professor A. S. Eve, Professor W. G. Fearnside, Professor L. N. G. Filon, Dr. J. Gray, Sir Daniel Hall, Professor C. R. Harington, Professor D. Keilin, Professor J. Graham Kerr, Dr. R. H. Pickard, H. R. Ricardo, Professor W. Stiles, Professor W. W. C. Topley and W. Trotter.

SCIENTIFIC NOTES AND NEWS

At the dinner of the National Academy of Sciences held in Chicago on November 17 the John J. Carty Medal award, with a premium of \$3,000, was presented to Dr. Edmund B. Wilson, Da Costa professor emeritus of zoology at Columbia University. The presentation was made by Dr. Frank B. Jewett, vice-president in charge of development and research of the American Telephone and Telegraph Company. In the absence of Professor Wilson, who celebrated his eightieth birthday on October 19, the medal was received by Professor Ross G. Harrison, of Yale University. The Public Welfare Medal was presented to Dr. H. S. Cumming, surgeon-general of the U. S. Army, retired, the address being made by Professor Ludvig Hektoen, of the University of Chicago.

At the convocation of the Royal College of Physicians and Surgeons of Canada on October 31, in Ottawa, honorary fellowship was conferred on Lord Tweedsmuir, governor-general of Canada, and on Dr. Henry A. Christian, Hersey professor of the theory and practice of physic at Harvard University and physician-in-chief, Peter Bent Brigham Hospital, Boston.

DR. WILLIAM K. GREGORY, curator in the department of comparative and human anatomy at the American Museum of Natural History, was elected president of the American Society of Ichthyologists and Herpetologists at the annual meeting, which was held at the University of Michigan.

DR. EDWARD BAUSCH, chairman of the board of the Bausch and Lomb Optical Company, Rochester, N. Y., has been awarded for "inventions and improvements of great merit in the technical and public sense" the medal of the American Society of Mechanical Engineers, which will be presented on the evening of December 1, in the auditorium of the society.

DR. W. V. D. HODGE, Lowndean professor of astronomy and geometry at the University of Cambridge, has been elected to a non-stipendiary fellowship at Pembroke College.

DR. GOTTLIEB HABERLANDT, professor emeritus of plant physiology at the University of Berlin, celebrated

the fiftieth anniversary of his doctorate on November 11.

THE *Journal* of the American Medical Association states that Professor Antonin Gosset, one of the two heads of the surgical department of the Paris Medical School, was recently elected a fellow of the Academy of Sciences. In order to celebrate the event, a number of assistants and colleagues of Professor Gosset are subscribing to a fund with which a sword (as is the custom on such occasions in France) will be presented to the new academician.

THE first Arthur Duckham research fellowship, valued at £350, has been awarded by the British Institute of Gas Engineers to Dr. Albert Edward Haffner, research chemist in the service of the Gas Light and Coke Company, London. Dr. Haffner will proceed to the Gas Institute, Karlsruhe, to carry out research of interest to the British gas industry.

DR. GEORGE GILMORE SCOTT, after thirty-six years of active service at the College of the City of New York, has retired from the professorship of biology. His address is 1394 Grand Avenue, Winter Park, Fla.

DR. A. M. H. GRAY, dean of the faculty of medicine at the University of London, is retiring, having reached the age limit.

DR. GEORGE P. MULLER, formerly professor of clinical surgery in the School of Medicine and in the Graduate School of Medicine of the University of Pennsylvania, has been appointed professor of surgery in the Jefferson Medical College of Philadelphia, to succeed the late Dr. Edward J. Klopp.

DR. JAMES FISHER was recently appointed dean of the faculty at the Michigan College of Mining and Technology, Houghton. Dr. Fisher, who is head of the department of mathematics and physics, has been associated with the teaching staff of the college since 1896.

WILLIAM E. STANLEY, consulting sanitary and hydraulic engineer of Chicago, has been made professor of sanitary engineering in the School of Engineering of Cornell University.

W. E. BRADT, until September 1 assistant professor

of chemistry at the State College of Washington, has become professor of chemistry and head of the department of chemistry and chemical engineering at the University of Maine.

DR. EDWIN E. OSGOOD has been placed at the head of the newly established division of experimental medicine in the University of Oregon Medical School. Dr. J. Guy Strohm has been made clinical professor of urology and acting head of the division of urology, and Dr. William K. Livingston has been appointed assistant professor of surgery.

DR. H. P. COOPER, head of the department of agronomy at Clemson College, S. C., was recently appointed director of the Agricultural Experiment Station.

The Experiment Station Record states that Dr. W. R. Dodson, until 1928 dean of the College of Agriculture of the University of Louisiana and director of the Experiment Station, subsequently in charge of animal husbandry work at the United States Department of Agriculture Iberia Live Stock Experiment Farm, has returned to the department of agronomy for teaching and extension work. The honorary degree of doctor of science was conferred upon him by the university on August 6 in recognition of his long service "to the youth of the State of Louisiana as a teacher and leader in agriculture, as an organizer of forces for the development of better agricultural conditions in the South."

MAUNSELL VAN RENSSELAER, formerly curator of the Blaksley Botanic Garden, Santa Barbara, Calif., has been appointed director and will administer the garden under the supervision of the board of trustees.

At the University of Oregon, the Condon Museum of Geology, Herbarium, State Museum of Anthropology and Museum of Zoology have been placed under one administrative officer, L. S. Cressman, and their budgets combined. The four units retain their separate curators.

DR. GARNER M. BYINGTON, Battle Creek, for four years medical director of the W. K. Kellogg Foundation, has resigned to become director of medical relations in the Detroit Department of Health. In his new position Dr. Byington will carry out a child health program in Detroit similar to that sponsored by the foundation in rural districts.

CARLOS E. CHARDON, formerly chancellor of the University of Puerto Rico, who recently resigned as regional director of the Puerto Rico Reconstruction Administration, left on November 16 for Venezuela and Colombia to continue agricultural research commenced

five years ago, when he made studies of the wild potato in Venezuela and drafted plans to establish a National College of Agriculture in Colombia.

PROFESSOR L. A. ORBELI, of Leningrad, now in charge of Pavlov's laboratories, has been appointed a member of the Permanent International Committee of the Physiological Congresses in place of Professor I. P. Pavlov, who died last February. The committee, therefore, is constituted as follows: F. Bottazzi (Italy), W. B. Cannon (U. S. A.), I. Frank (Germany), A. V. Hill (Britain), *secretary*, B. A. Housay (Argentina), Y. Kuno (Japan), L. Lapicque (France), G. Liljestrand (Sweden), L. A. Orbeli (U. S. S. R.)

LINCOLN ELLSWORTH, the explorer, sailed on November 18 to deliver the annual toast before the American Club in London on Thanksgiving Day. While there, he will deliver a lecture on his Antarctic explorations before the Royal Geographical Society.

PROFESSOR THEODOSIUS DOBZHANSKY, of the California Institute of Technology, gave during October a series of eight seminars on "The Genetics of Species" in the department of zoology at Columbia University.

DR. DAVID SARNOFF, president of the Radio Corporation of America, New York City, gave on November 18 a lecture before the Franklin Institute of Philadelphia on "Three Decades of Radio." Before the lecture, Dr. Sarnoff was the guest of honor at a dinner given by the directors of the Franklin Institute at the Rittenhouse Club.

DR. GEORGE R. MINOT, professor of medicine at the Harvard Medical School, delivered the sixth Walter M. Brickner Lecture at the Hospital for Joint Diseases, New York City, on November 19. His subject was "Anemia: the Etiology, Diagnosis and Treatment."

RECENT lecturers at the hospital of Duke University and their subjects were: October 30, Dr. A. Graeme Mitchell, of the Children's Hospital, Cincinnati, "The Various Phases of Endocrinology"; November 3, Dr. Sanders L. Christian, of the U. S. Public Health Service, "A Résumé of the History of the United States Public Health Service and the Various Functions of Each Department"; November 7, Dr. George W. McCoy, of the U. S. Public Health Service, "The Recent Advances in Epidemiology."

THE fifty-seventh meeting of the American Astronomical Society will be held at Hood College, Frederick, Md., on December 28, 29 and 30.

THE forty-ninth annual meeting of the Geological Society of America will be held on Tuesday, Wednesday and Thursday, December 29 to 31, in Cincinnati,

Ohio, under the auspices of the University of Cincinnati. The retiring president, Dr. W. C. Mendenhall, will deliver his address at the Netherland Plaza Hotel in the evening of December 26.

THE winter meeting of the American Society of Agricultural Engineers will be held in the Stevens Hotel, Chicago, from November 30 to December 4. The society will meet in four technical divisions on farm power and machinery, farm structures, rural electrification and soil and water conservation. Between 300 and 400 agricultural engineers and others interested in agricultural engineering are expected to attend.

It is reported in *Museum News* that at a conference of museum representatives held at Melbourne in May, 1936, a resolution was passed that a museum association be formed in Australia and New Zealand and that the first meeting be held in New Zealand in January, 1937. The conference at Melbourne was arranged and financed by the Carnegie Corporation of New York. It was attended by delegates from twelve museums and art galleries in Australia, four in New Zealand and one in Tasmania.

By the will of the late Mrs. M. B. Graham the income from her estate of approximately \$350,000 is left in trust to be divided between her husband, Samuel Jordan Graham, of Washington, and Laurence Stokes Fuller, of Paris. Upon their deaths the prin-

cipal, will be given to the Johns Hopkins University to be used in seeking a cure for infantile paralysis.

THE *Journal* of the American Medical Association reports that an estate estimated at more than \$200,000 has been bequeathed to the University of Pennsylvania by the late Frances T. Kinsey to support and develop the Gastro-Intestinal Clinic at the University Hospital under the direction of Dr. Thomas Grier Miller, or for such other activities in this field as he may desire. After Dr. Miller severs his connection with the university hospital the income is to be used for such similar activities as the professor of medicine may desire. The fund will be known as "The Kinsey-Thomas Foundation for the Study and Treatment of Diseases of the Digestive System." It is to be a memorial to two sisters and a brother-in-law of Miss Kinsey.

DR. OWEN H. WANGENSTEEN, professor and head of the department of surgery at the University of Minnesota, and Dr. Alton Ochsner, professor and head of the department of surgery at Tulane University, will edit, with Dr. Alfred Blalock and Dr. William F. Rienhoff, Jr., as associate editors, a new surgical journal beginning on January 1, entitled "Surgery, A Monthly Journal Devoted to the Art and Science of Surgery." This journal is not to be the official organ of any group or organization, but will essay to give early publication to new and original material written up in concise form.

DISCUSSION

SIGNIFICANT FIGURES IN STATISTICAL CONSTANTS

It is to be hoped that the rule for retaining significant figures in statistical constants proposed by E. B. Roessler in a recent issue of *SCIENCE*¹ will not be adopted very widely by those "workers in social and biological sciences" who "are not mathematicians and use statistical analysis only as a necessary tool." The rule proposed is as follows: "*In a final published constant retain no figures beyond the position of the first significant figure in the standard error; keep one more place in all computations.*"

There are two parts to the rule, and the arguments against it apply to the parts separately.

The arguments in favor of rounding off a reported statistic have been given by the proponent of the above rule: not only is much time wasted on computations, due to the retention of more figures than the

precision of the data warrants, but results expressed to many decimal places without regard to their precision give a very misleading impression of the accuracy of the result. Of these two arguments, the first is the more important, since the existence of any number of decimal places in a statistic accompanied by its probable error will not give any misleading impression of accuracy to a competent reader.

Since results are not generally presented to an indefinite number of decimal places, the question is not *whether* to round off, but *how far* to carry the rounding-off process. If more figures are retained in the published result than are warranted by the precision of the data, then the only real harm seems to be in the waste of time devoted to computation. The reader can do his own rounding off. If, on the other hand, the rounding-off process is carried too far, then the published result does not give all the information contained in the data and the reader is unable to supply the lack. It would therefore seem reasonable to advo-

¹ *SCIENCE*, 84: 289-90, September 25, 1936.

cate caution in the rounding off of such numbers. This applies especially to the reports of such statistics as may be used by a reader in further calculations for some special purpose of his own. If correlation coefficients and reliability coefficients are reported, for example, the reader may wish to employ these in estimating the value of the correlation coefficient corrected for attenuation. For this purpose, he will want values sufficiently accurate so that his final estimate of the correlation coefficient corrected for attenuation will be in error only through the unreliability of the original data and not through the rounding-off errors in the published numbers.

These considerations apply to biological, economic and social statistics as much as to any other. In this connection, Dr. Roessler argues that, "since the errors of measurement are ordinarily tremendously greater in biological, economic and social investigations than in physical observations, the retention of more than one doubtful figure in a constant is unjustified." A consideration of the standard error concept would lead us to believe that the relatively larger errors of measurement in social investigations would result in obtaining relatively larger estimates of the standard errors of the statistics from them, and that any sound procedure for rounding off a statistic in the light of its standard error should therefore apply as well to social as to physical data.

In the light of these various considerations it seems desirable to urge Kelley's suggestion² rather than Dr. Roessler's. That is, keep the figures in the reported result to the place indicated by the first figure of one half the probable error.³

The number of places which must be kept in the computations in order to guarantee the accuracy of the last figure in the reported result will depend, of course, on the nature of the computations.⁴ If any single rule is to be followed, it should be one which would guarantee the accuracy of the last retained figure from any of the more ordinary types of computation. Walker and Sanford have shown⁵ that if the less accurate of two approximate numbers contains n significant digits, their product and their quotient each contains n or $n-1$ significant digits. And about once in four times the error will affect one more place than this rule states.

² SCIENCE, 60: 524, 1924.

³ This amounts to the insertion of "one third of" in front of "the standard error" in Roessler's rule. Thus the two rules often result in keeping the same number of places.

⁴ Incidentally it is to this problem that Scarborough addressed his treatment in *Numerical Mathematical Analysis*, p. 11, quoted by Roessler.

⁵ Helen M. Walker and Vera Sanford, "The Accuracy of Computation with Approximate Numbers," *The Annals of Mathematical Statistics*, vol. 5, no. 1, pp. 1-12, 1934.

It would therefore seem desirable to keep two more places in computation than the number of places to be reported.

The following rule should therefore be urged instead of the one proposed by Dr. Roessler: *In a final published constant, retain no figures beyond the position of the first significant figure in one half the probable error; keep two more places in all computations.*

P. J. RULON

HARVARD GRADUATE SCHOOL OF EDUCATION

SELENIUM BEARING VEGETATION DURING LATE CRETACEOUS TIME¹

DURING the past year evidence has been obtained that points clearly to the fact that at the time the continental portion of the Medicine Bow formation was being deposited certain plants were present that absorbed selenium in large quantities. The preservation of selenium in these plant-bearing rocks is all the more striking because of the fact that the samples taken for analysis were from weathered surfaces and from beds tilted at steep angles. Leafy carbonaceous shale has been collected from a type section in southern Albany County, Wyoming, that has given upon analysis over 150 parts per million selenium. Sandstones contacting these seleniferous carbonaceous veins have yielded as high as 157 parts per million selenium. Sandstones in this formation not subjected to this influence are only moderately seleniferous if at all. The concentration of selenium in the carbonaceous material is confined to the top part of a vein where skeletal leaves and other vegetable characters are still recognizable. The coal and lignitic matter in the Medicine Bow formation has been found to be only sparingly seleniferous. This fact correlates with current observations in that selenium absorption in quantity is a highly specialized phenomenon and therefore not common to all native plant genera.

This is the first evidence that has been found in the Rocky Mountain region showing an unusual enrichment of selenium in vegetative remains during Cretaceous time. While it is true that one may find seleniferous carbonaceous matter, for example, in the basal Dakota (Lower Cretaceous) that yields more selenium than is found in the associated conglomerates, yet the selenium content of the Medicine Bow material reported on is in a class by itself when compared with any other carbonaceous beds that have been examined thus far.

These data, brought out in the study of the non-marine portion of the Medicine Bow formation, confirms the theory advanced by the Wyoming investiga-

¹ Contribution from the Research Chemistry Department of the University of Wyoming.

ers that many of the toxic areas existing at present in the Rocky Mountains area in soils and shales of a definite geological character have been brought about by vegetative enrichment of selenium through cycles of growth and decay of highly seleniferous native plants, such as the *Astragali* represented by *A. bisulcatus*, *A. sabulosus*, *A. racemosus*, *A. pectinatus*, *A. viriflorus*, *A. grayi*, etc.

O. A. BEATH
C. S. GILBERT

MOUNTAIN ROAD CASUALTIES AMONG ANIMALS IN COLORADO

IN July, 1935, I noted the number of dead animals, mostly mammals, seen on mountain roads in a portion of Colorado. The results of this study were published in SCIENCE for January 3, 1936, "Casualties among animals on Mountain Roads."

I was in essentially the same region from the 7th to the 19th of August, 1936, accompanied by Robert E. Everts of Denver, who did the driving and noted more of the victims than I.

The itinerary was as follows: From Colorado Springs through Cañon City and Salida, across Monarch Pass to Gunnison; thence north to Crested Butte and the "ghost towns" of Gothic and Pittsburgh. Returning via Gunnison we went to Montrose over Blue Mesa, and returned the same way to Gunnison, Monarch Pass and Colorado Springs. The homeward trip from Cañon City to Colorado Springs was made via Florence and Pueblo, a roundabout route taken because of rainy and stormy weather.

The most notable differences between the 1936 list and that of 1935 are the greater number of Say's ground squirrels, 27 instead of 12, a less number of prairie dogs, 36 instead of 56, and five chipmunks, when none were recorded for 1935. The road from Cañon City to Colorado Springs via Pueblo is really a plains road, and I give the list for that separately.

The list follows: Mammals: cottontail rabbit, proba-

bly *Sylvilagus nuttalli pinetis*, 3; white-tailed jack rabbit, *Lepus townsendi townsendi*, 3; Wahsatch chipmunk, *Eutamias minimus consobrinus*, 5; Say's ground squirrel, *Callospermophilus lateralis lateralis*, 27; Gunnison's prairie dog, *Cynomys gunnisoni*, 36; mouse, sp. 2; muskrat, 1. Birds: sparrow, sp. 1; bird, sp. (?), 1; barn swallow (?), 1.

Between Cañon City and Colorado Springs via Pueblo were noted 5 pale striped ground squirrels, *Citellus tridecemlineatus pallidus*; 1 kangaroo rat, *Dipodomys ordi richardsoni*; 1 black-tailed jack rabbit, *Lepus californicus melanotis*; 1 plains cottontail, *Sylvilagus auduboni baileyi*; and a bull snake, *Pituophis*, sp.

EDWARD R. WARREN

COLORADO SPRINGS, COLO.

PORRITCH FOR DR. MORRIS

IN SCIENCE for September 25 that versatile Nestor of science, Dr. Robert T. Morris, surgeon, geneticist, dendrologist, horticulturist, caryologist and ichthyologist, under the caption "Wanted: A New Word," appears in quest of an uncoined term, which he specifies "should be from the Greek," to indicate the mud-enveloped food of bullheads, flounders, wild ducks, etc.

The Greeks, as usual, "had a word for it"—at least they referred to mud-feeding critters as "borborophagous" (βορβοροφάγος). If umbrage be taken to that term as cacophonous and sesquipedalian, perhaps ilyophagous (ἰλύς, mud) might be preferred. Slime-feeders, therefore, could be called *ilyophagi*, and their habits *ilyophagous*. The words βρωμα (that which is eaten; food) or, I think more appropriately and euphoniously, τροφή (nourishment; food) could then be suffixed to the food-source itself. Thus, *ilyotrophe* (or *ilyobroma*) for the mud-food, and *ilyotrophism* (or *ilyotrophy*) for the food habit of these animals.

W. A. DAYTON

RANGE FORAGE INVESTIGATIONS,
U. S. FOREST SERVICE

SCIENTIFIC BOOKS

TIME AND SPACE

Geometry of Time and Space. By ALFRED A. ROBB. vii + 408 pp. Cambridge University Press, 1936.

THIS volume is essentially a second edition of Professor Robb's "A Theory of Time and Space" published in 1914. It contains, however, a much extended, illuminating introduction and new mathematical material. Many of the proofs of theorems have been given in simpler form.

There lies implicit in Einstein's special theory of relativity a four-dimensional space-time geometry in which "points" represent "events"; this geometry was

first formulated by Minkowski. In space-time the fundamental geometric relation is that of the "interval" between two events.

Now there are two contrasting points of view which may be taken in the systematic logical development of the appropriate geometric ideas. The first proceeds from the qualitative to the quantitative, and is strictly analogous to the Euclidian postulational approach to ordinary geometry. It is this kind of approach which Robb has chosen to use in his book. The basic relationship from which he starts is that of one event, B, being *after* another, A: speaking physically, B is *after*

A if, for some idealized reference particle P, the two events may be regarded as happening at P, the event B happening after A at the particle. Evidently the notion of *after* so defined is more fundamental in character than that based on the classical concept of absolute simultaneity.

Robb's development culminates in the proof of the quantitative formulas basic in the analytic geometry of the space-time.

The alternative type of approach is that associated with the name of the great mathematician, Riemann. Here we proceed inversely from the quantitative to the qualitative, in the following manner. Between any pair of points (events) is assumed a relationship called *interval*. The numerical intervals s between all possible pairs of points may be thought of as given in an (infinite) double entry table. Now it happens that this complete table may be condensed in a single formula, namely,

$$s^2 = (t_2 - t_1)^2 - (x_2 - x_1)^2 - (y_2 - y_1)^2 - (z_2 - z_1)^2$$

where (t_1, x_1, y_1, z_1) and (t_2, x_2, y_2, z_2) are to be thought of as mere labels attached to the points. Geometric facts consist of all those properties ultimately expressible in terms of points and intervals only.

This second Riemannian mode of approach is very much more brief and direct than the Euclidian approach adapted by Robb. In a day when the quantity of mathematical material to be absorbed has become of enormous extent, one can scarcely afford the time necessary to follow the logical sequence of Euclidian ideas set up by Robb when a much deeper understanding is available in this alternative simpler way. Yet the task performed by Robb is well worth doing, inasmuch as the kind of space-time which he treats is so basic in physical theory that it should be treated from different points of view. However, physicists and mathematicians who know the elements of ordinary geometry and possess a slight acquaintance with the physical facts underlying the special theory of relativity will continue to hold firmly to the Riemannian point of view, if only for reasons of intellectual economy.

GEORGE D. BIRKHOFF

THE SCIENCE OF THE EARTH

Down to Earth. By CAREY CRONEIS and WILLIAM C. KRUMBEIN. 501 pp., many ill. University of Chicago Press. \$3.75.

THIS is a new-style text-book intended primarily for use in the "New Plan" for instruction at the University of Chicago. It is, however, eminently suitable for any introductory course in geology in any institution. Incidentally, it is also nicely adapted for the general

reader who wants to be pleasantly introduced to the science of the earth.

The break with tradition reveals itself most conspicuously in the format of the volume. The large bold type, wide spacing of lines and paragraphs, the liberal use of black-face type and larger type for the initial words of paragraphs, the poetical quotations which embellish most chapters and the simplified diagrams and cartoons, ultra-modern in conception, leave nothing of the stodgy appearance of the classical treatise on a recondite subject. The authors and publisher have recklessly opened themselves wide to the charge that they have succumbed to the lure of the age of jazz and are trying to give to science a popular swing. The charge will doubtless be hurled, but in the reviewer's opinion, it will be entirely muffled by the paeans of rejoicing which their book will also evoke.

The departure from traditional style is also apparent in the text itself—more so in the first than in the second half of the book. There is a studied effort "to enliven the subject without in any sense writing it down." Although the authors have not approached their topic in any spirit of levity, they are witty and facetious on every possible occasion, and occasionally they make use even of slang. The flavor of their writing is well illustrated by many of the chapter headings: "Second-rate Planet" covers the description of the size, shape and density of the earth. "The Tooth of Time" is the title of the chapter on rock weathering. "End of the Line" is the camouflage for an essay on stream deposits. "What Price Continents" intrigues the reader to the consideration of crustal warping which renews the altitude of lands above seas. "Volcan's Chimneys" refers, of course, to volcanoes. "Universal Cemetery" is the heading of the chapter on fossils and fossilization. "Gargantuan Calendar" introduces the geologic time scale. "Invertebrate Heyday" reveals the record of invertebrate life in early Paleozoic time. "Crossing the Strand" describes the ascent of air-breathing quadrupeds from their piscine progenitors. "Megalomania" is the heading for the chapter on dinosaurs, and "Money and Politics" is a ten-page review of the economic aspects of geology.

Beneath this lightness of touch there is, however, plenty of good solid geology. The customary topics of a college course in "introductory geology" are all here and for the most part are treated in the usual sequence—the materials of the earth, processes which alter the surface of the earth, history of the earth and its inhabitants through geologic time. Not all the problems of geology are solved; indeed, the reader will inevitably gain the correct point of view "that the science of geology is a living, changing, growing one."

The treatment of illustrative material is especially

table. Hundreds of "thumb-nail sketches," diagrammatic representations of geologic phenomena and numerous drawings adorn the pages of text. These from the facile and oftentimes facetious pen of Richi Lasley and help greatly to clarify ideas and maintain interest. Photographic illustrations have been chosen with great care. Almost all are new pictures not previously used in text-books of geology. Many are photographs taken from the air, a point of view which is particularly illuminating in any study of the face of the earth.

The photographs are all assembled on 64 rotogravure plates, four to six pictures per plate, grouped in four fascicles of 16 pages each, distributed at roughly equal intervals throughout the book. This grouping of the pictures was, of course, dictated by the mechanics of press room and bindery, but the authors have done more than bravely bow to the inevitable. "Each group contains the plates that illustrate the chapters immediately preceding or following. The individual plates illustrate or elaborate on

certain concepts presented in the chapters to which they are referred, but they have been designed to tell their own stories. They may be studied, therefore, as a group when the rotogravure sections are reached in the text, or they may be consulted in connection with each chapter. . . . It is hoped that this type of organization will enhance the usefulness of the book by making available for comparative study, in appropriate groups, the photographs on related subjects that commonly are widely scattered throughout a text."

This is a book which will arouse strong sentiments of approval or disapproval. It will either be greatly liked or energetically disliked; no one who appraises it can remain lukewarm. Its success as a teaching tool can only be ascertained by practical experience with it. Certainly, the experiment is well worth trying and in the opinion of the reviewer the chances are excellent that it will prove to be an unusually satisfactory piece of equipment for the modern classroom.

KIRTLEY F. MATHER

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SPECIAL ARTICLES

PROPAGATION OF RABIES VIRUS IN TISSUE CULTURE AND THE SUCCESSFUL USE OF CULTURE VIRUS AS AN ANTIRABIC VACCINE

Rabies virus is being propagated in tissue culture. The culture virus, when used as a vaccine, protects mice adequately against "street rabies" virus.

The cultivation of rabies virus is carried out in the following manner. Using aseptic technique throughout, 50 cc Erlenmeyer flasks are prepared with 4 cc of sterile solution containing 10 per cent. normal monkey serum plus 0.02 cc of a thick suspension of minced mouse embryo brain. This flask culture medium is then inoculated with 1 cc of a 1 to 100 dilution of the brain of a mouse prostrate on the 7th or 8th day following an intracerebral injection of rabies virus. At 4 day intervals, the contents of the flask is withdrawn to a centrifuge tube, allowed to settle, and 1 cc of the relatively clear supernatant is transferred to a second culture flask. This passage technique is repeated routinely and the virulence of the culture virus is titrated by inoculating the material intracerebrally in tenfold dilutions in Swiss mice.

Skunk strain 3, following 7 mouse passages, has now been carried through 16 serial subcultures, and when inoculated into mice has been uniformly fatal through the 10^{-2} and for the most part, the 10^{-3} dilutions. If the virus were merely surviving, the repeated dilution would have eliminated it at the transfer to the 6th subculture. Its persistence and titre indicate that it is

actually multiplying in the tissue medium. Dog strain 1, following 88 mouse passages, has likewise been successfully cultivated.

The culture virus produces typical dumb rabies in mice, following intracerebral, lingual and muscular inoculation, and is neutralized by sera from persons given Semple antirabic vaccine.

The possibilities of using tissue culture virus as an antirabic vaccine are being investigated. Rabies vaccines in current use are composed largely of animal brain or cord tissue containing virus in either a virulent or an inactive form. Nervous tissue is not only a superfluous, but a potentially dangerous vehicle which may produce paralysis following vaccination, hypersensitive reactions or secondary infections of animal origin. Until now, however, no other source of virus has been available and the brain tissue has remained inseparable from the virus.

The disadvantages accompanying the use of animal tissue as a source of virus are largely overcome by the use of culture media. The culture virus protects mice effectively against a direct brain inoculation of rabies "street" virus. A single peritoneal injection of the undiluted culture virus is innocuous and within 10 days makes the animal resistant to 100 intracerebral fatal doses of "street" virus of homologous or heterologous strains. The subcutaneous route of vaccination is not effective. The amount of active virus necessary for immunization is the same for both tissue culture

and mouse brain strains, namely, about 10,000 intracerebral fatal doses.¹

Dogs given a single peritoneal injection of culture virus remain healthy and show neutralizing antibodies in their sera against the homologous "street" virus strain within 14 days. Their ability to resist subsequent exposure to "street" virus is now being tested.

LESLIE T. WEBSTER
ANNA D. CLOW

THE ROCKEFELLER INSTITUTE
FOR MEDICAL RESEARCH

A CHEMICAL REAGENT FOR THE DETECTION AND ESTIMATION OF VITAMIN B₁

THERE has not been reported as yet in scientific or patent literature any information concerning a specific chemical reagent capable of reacting with small quantities of vitamin B₁.^{1, 2} Such a reagent would provide a means of qualitative as well as quantitative estimation of the vitamin in foodstuffs or biological preparations.

Investigation carried out in our laboratory has shown that certain derivatives of aniline or the naphthyl amines have the property of producing characteristic colorations with solutions of the vitamin. After intensive research it was found that certain derivatives under certain conditions will react with vitamin B₁ to produce a stable colored compound which is insoluble.

We have found that when a solution of either p-amino acetanilid or methyl-p-amino phenyl ketone (p-amino acetophenone) is treated with nitrous acid and the resultant product is treated under certain conditions with vitamin B₁, there is produced a characteristic purple red compound which is stable and highly insoluble in water. The solutions of the treated amines will not react under these conditions with any substances as yet tried to form the same characteristic insoluble compounds which are colored.

The respective reagents produced from the amines mentioned have been successfully tried on samples of wheat germ, rice polishings, Seidell's International Adsorbate, Anheuser-Busch yeast concentrate, Merek concentrate, Eli Lilly adsorbate, Merek crystals (natural) and synthetic crystals from the Winthrop Chemical Company (Windaus synthesis). In each case the same characteristic product previously mentioned was obtained.

The colored vitamin-reagent compound may be extracted by means of a suitable selective solvent. Such

¹ A short report on the immunization of mice against rabies will appear in the *Am. Jour. Pub. Health*, 1936 (December).

² This research was supported by a grant from Eli Lilly and Company, Indianapolis, Ind.

³ Preliminary report. The authors wish to express their appreciation for the kind suggestions received from Dr. S. M. Weisberg, Sealtest System Laboratories, Inc., Baltimore, and Dr. Elsa R. Orent, of this laboratory.

a method may afford means of concentrating vitamin B₁. Since the coloration is of a permanent nature, it provides a method for the quantitative as well as qualitative estimation of the vitamin. This test is extremely sensitive; preliminary examinations show that determinations may be made within several millionths of a gram of the active material.

Work is now under way to permit accurate chemical determination of vitamin B₁ in natural products as well as commercial preparations.

Investigation on regeneration of the vitamin-reagent compound and feeding tests of such products is now in progress.

Further details on the progress of this problem will be published in the near future.

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EFFECT OF COLORED CELLOPHANE ON THE PRODUCTION OF SUN-RED COLOR IN MAIZE

PRELIMINARY attempts have been made to determine, if possible, the wave-length of light responsible for producing the sun-red pigment in maize plants of the genetic composition *A B pl*.

It has been long known that such plants when exposed to light develop a red pigment in all parts of the plants, especially pronounced in the husks on the ears. The outer husks are deep red, while those underneath show very little if any of this color. Ears that develop under kraft paper bags fail to develop pigment.

In this experiment we used several hand-pollinated ears of a stock of Purdue 39 × Connecticut 75 (*A B pl*), backcrossed twice to Purdue 39 and then selfed once. The plants were either homozygous *B B* or *B b*, otherwise were quite uniform. The ear shoots were bagged as soon as they appeared, and the developing ears were also covered with kraft paper bags. Hence the husks had not been exposed to sunlight and showed no red color.

On September 15, 1936, the paper bags were removed and the ears were covered with various colors of Cellophane purchased at one of the S. S. Kresge stores. Four ears were covered with each kind of Cellophane. The colors used were red, pink, Tango (yellow), amber, dark green, dark blue, light blue, violet and light violet. Also four ears were covered with clear Cellophane to serve as checks.

On October 1, the ears were harvested and the color of husks noted. By that time an intense red had developed under the clear wrapping and all but one of the

colored ones. This exception was the dark red color under which the husks remained green. This Cellophane transmitted no light at all below 5,400 Ångström units, as shown by a spectral analysis secured from E. I. du Pont de Nemours and Company. Here the transmission was but 2 per cent. At 5,800 units there was 18 per cent. transmission, while at 6,500 units the transmission was 86 per cent. The range of transmission was much narrower for the red than for any other color used, the effective transmission being mostly between 5,800 and 6,500 Ångström units. All the other shades used had a greater range of transmission, covering almost the entire visible spectrum as well as transmitting considerable ultra-violet light. Much more selective filters will be necessary to localize the area chiefly responsible for the production of sun-red. Further work on this subject is in progress.

It is not possible to state as yet just what wavelength of light is most effective in the production of sun-red. Red light alone is not capable of producing the red color.

W. RALPH SINGLETON

CONNECTICUT AGRICULTURAL
EXPERIMENT STATION

BENTONITE IN THE UPPER CRETACEOUS OF NEW JERSEY¹

ON October 12, 1936, the writer, in company with Charles W. Carter, a graduate student in the Geological Department of Johns Hopkins University, examined a 30-foot section of Upper Cretaceous sand in a cut of State Highway 41, 3 miles southwest of Haddonfield, $\frac{3}{4}$ mile northeast of Runnemede, Camden County, New Jersey. The material consists mainly of massive, unconsolidated, marine sand containing evenly distributed dark grains of glauconite in a proportion such as to give to the sand a so-called "pepper-and-salt" appearance. Poorly preserved markings of *Halymenites major* Lesquereux were observed at several places in the sand, particularly in the upper part. In an inconspicuous, nearly horizontal layer 5 or 6 inches thick, 12 feet below the top of the cut, the sand contains numerous fragments of a soapy, clay-like substance resembling bentonite, up to a maximum dimension of perhaps 2 inches. As shown on the state geological map of New Jersey, this sand falls within the lower part of the unit mapped as Wenonah and Mount Laurel sand and probably belongs to the Wenonah.

The clay fragments in the sand do not appear water-worn. Apparently the clay was deposited in a continuous layer and was later mechanically broken up, possibly by differential compaction of the sand. A

sample of the clay was submitted to Dr. C. S. Ross, of the U. S. Geological Survey, whose report is quoted herewith in full.

The clay sample from 3 miles southwest of Haddonfield, New Jersey, has been studied in thin section, and it proves to be bentonite with unusually well preserved volcanic ash structures. Very perfect plate-like, Y-shaped, and lute-shaped volcanic shards are only partly altered to glass or perhaps more probably to the type of clinoptilolite described by M. N. Bramlette and E. Posnjak from bentonites (*Am. Mineralogist*, vol. 18, pp. 167-171, 1933). The shards vary from .05 to .15 millimeter in their longest direction and average .10 millimeter. The shards are transparent and isotropic or slightly birefracting, but show more strongly birefracting alteration products along their borders. These shards are in a matrix of typical bentonitic clay which forms at least 75 per cent. of the material. Associated with this are a few grains of oligoclase, orthoclase and biotite. Quartz and glauconite grains are present in small amount and no doubt represent sedimentary materials, but the admixture with these has been small.

This sample presents such perfect ash structures, and such characteristic minerals that its volcanic origin is indicated with more than usual clearness.

Mr. P. G. Nutting has made acid-leach and oil-bleach tests and finds that the material has the properties of a very pure bentonite that has been rather completely leached by percolating waters.

According to Ross, the material is a true bentonite. So far as known to the writer, it is the first authentic bentonite deposit recorded from the North Atlantic Coastal Plain. Although this bentonite possesses good bleaching qualities, the meagerness of the deposit renders it of no commercial importance. It is, however, of great scientific interest because there is general agreement among authorities that bentonite originates from volcanic ash. Where was the volcano that furnished the ash from which this New Jersey bentonite was formed?

There are volcanic vents of Cretaceous age in southwestern Arkansas, and deeply buried volcanic rocks of that age have been identified from wells at Jackson, Miss. Although volcanic ejectamenta of the kind that would produce bentonite are known to have been carried by wind and deposited in beds of measurable thickness as far as 600 miles from their source, the Cretaceous volcanoes of the Gulf region seem too far away to account for this North Atlantic bentonite. The volcanic necks of southwestern Arkansas are fully 1,100 miles from the New Jersey locality, and Jackson, Miss., is distant therefrom more than 1,050 miles. Volcanoes to the eastward in some area now covered by the waters of the Atlantic Ocean might be considered as a possible source. The Bermudas, distant a little more than 700 miles, are known from one well boring to be underlain by volcanic rock, but the age

¹ Published by permission of the Director, U. S. Geological Survey, Washington, D. C.

of this rock has not been definitely determined. Submerged Cretaceous volcanoes may exist nearer the Atlantic Coast than the Bermudas. An opposing

argument to an eastern source would be the prevailing wind direction, which at present is toward the east.

LLOYD WILLIAM STEPHENSON

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A TECHNIQUE FOR THE SLIDE CULTURE OF FUNGI

IN an attempt to obtain uncontaminated slide cultures of various fungi in the biological laboratories of the University of Pittsburgh, where a sterile chamber is not available and where conditions are as yet particularly unfavorable because of unplastered walls and many cross-draughts, a technique was employed which permitted all stages of typical growth on one slide and also made available a slide culture particularly satisfactory for permanent mounting.

Microscope slides were sterilized in 30 × 140 mm test-tubes, which were ordered from a local supply house to fit the regulation size slides. Sterile agar medium, tubed in quantities of 3 to 5 cc, was melted and cooled to the point of gelation. The agar was shaken to break up any lumps which were forming; the plug was removed, the mouth of the tube flamed, and the agar poured over the sterile slide in a similarly flamed tube. As the agar flowed down the slide it hardened and formed an uneven layer on which several light inoculations were made. A very dilute suspension of spores in the agar to be poured was sometimes substituted for the latter step.

After about forty-eight hours of incubation at room temperature, the agar film was usually dry enough to permit the elimination of drying before mounting. The unevenness of the film allowed for all stages of growth from spore germination to spore formation. Plasmolysis was exhibited only at the center of old colonies, or where the agar layer was insufficiently thick. No difference was observed between slides incubated without the addition of sterile water to the tube and those incubated with several cubic centimeters.

A simple technique, recommended by Henri¹, was used for permanent mounting. After fixation for several minutes in a solution of 100 cc 50 per cent. alcohol, 6.5 cc formalin, and 2.5 cc glacial acetic acid, a change was made to 35 per cent. alcohol and then to distilled water. Staining five minutes in an acid dye was followed by washing in distilled water until all the stain was removed from the agar. The slide was then dried in air overnight and mounted in balsam.

MIRIAM T. MALAKOFF

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¹ Henri¹, "Molds, Yeasts, and Actinomyces," John Wiley and Sons.

SIMPLIFIED PREPARATION OF MICROSCOPE CROSS HAIRS

FOR some time I have been using spider silk for the cross hairs in the oculars of my microscope. This was a rather tedious procedure because the spiders that are usable are not always at hand and even when they are, it is a long and delicate procedure to draw out the compound thread from the spinnerets, separate a single component and then without breaking or tangling to lay it accurately upon the glue previously applied to the diaphragm.

Recently I found a much quicker and more convenient method of producing "hairs" equal or even surpassing in fineness those produced from spider silk.

This I accomplished with a commercial waterproof adhesive. By taking a small globule of this transparent substance on the end of a probe and touching it to the surface of the diaphragm in the ocular, the removal of one lens of the ocular is all that is necessary, then pulling the probe away some nine or twelve inches there remains a single extremely fine and elastic, though not very adhesive, thread connecting the side of the diaphragm and the probe. Then moistening the opposite side of the diaphragm opening with the same adhesive, being careful to dispose of the resulting thread without entangling it with the first one, catch the first thread a little short of the length necessary to cross to the other side and stretch the necessary amount and touch to the adhesive on the opposite side. This method has several advantages over the spider silk method previously used: the diaphragm does not have to be removed from the ocular tube with consequent necessity for adjustment when replaced in the tube to bring the thread into sharp focus; it is so easily applied, the placing of a single hair requiring no more than two minutes from the time the ocular is removed from the microscope until it can be replaced ready for use, that these threads can be removed or replaced as needed without losing much time. The thread is single, which gives a fine sharp image and in addition is elastic, automatically taking up any slack in the line. One precaution must be used. When preparing the thread it is necessary to pull evenly. If it is drawn out in jerks there will be irregularities in thickness of the resulting thread. When using this method, the same substance acts both as the adhesive and the thread.

A. WILSON FOOTER

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